The Chemical Age

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Notes and Comments

The Petroleum Bill

THAT legislation was to be introduced upon the subject of British petroleum was a complete surprise to most people when Mr. Runciman made his recent announcement in Parliament. It was particularly surprising to the technical fraternity since, although we are given to understand that during recent months there have been indications of increasing interest in commercial circles upon the possibility of tapping oil in this country, the careful geological examination of the probabilities made some 16 years ago had led to the conclusion that it was unlikely that more than small quantities of oil could ever be found here. Search was made at that time in accordance with suggestions by the Geological Survey as to the most probable localities, but the only tangible result was negative except at Hardstoft, in Derbyshire; even here the oil was not found in paying quantities. It may be that the Geological Survey was wrong and that an oilfield of considerable extent may underlie our coal measures. Hydrogenation research has pointed to a possible source of oil formation during the process of coalification, or ageing of the original vegetation, but, having had experience of the ways of commercial circles—and particularly of financiers—we are more disposed to believe that the " interest " evinced has not arisen by reason of fresh geological evidence, but primarily because attention has been focused upon oil by recent legislation and propaganda for coal, so that in certain quarters there is a disposition to believe that " there is money in it."

A Precautionary Measure

It may be that our pessimism is not justified; we shall be delighted if we are proved hopelessly wrong and if a new " Iraq " is found in England. No doubt the Government has taken the view that it is better to safeguard the position to prevent unregulated developments before the event, rather than after. If the present Bill is to be regarded purely as a precautionary measure, we have nothing to say against it in principle. We would, however, desire to be assured that the gloomy predictions of our esteemed contemporary " The Independent " are not too well founded, in that some industrious civil servant " has discovered this neglected opportunity for official activity, muddle, and expense." Whether there is oil in the country or not, it cannot be denied that the 1918 Act which appropriated to the nation any oil that might be found under our soil has discouraged private enterprise in searching for petroleum. It is questionable whether this provision has had the decisive effect, but it is certain that the 1918 Act, coupled with the non-success of the previous search, has so killed any hopes of a home petroleum industry as to make the 1934 Bill a seven days' wonder.

Possible Effect on Oil Companies

We cannot understand why, in the present Bill, it should be found necessary to annul licences granted in 1918. A few people had the foresight to take out licences in those day, and probably spent not inconsiderable sums of money. Therefore, it does not seem fair to deprive them of benefits that might arise from their pioneering efforts, provided that the licences then granted are not used to prevent developments. Doubts have also been expressed as to the wisdom of boring for oil in this country in view of the amount of British capital invested in Iraq and other foreign oilfields. We cannot take the view that this should stand in the way of home development, more especially as we have no doubt that the great oil companies would quickly find means of adding British oilfields to their properties if any should be found. Investors in oil must always take the risk that competing wells will be opened: and in that uncertainty they are not differently placed from investors in other industrial concerns. Personally we believe that they can sleep peacefully; oil may be found here, but not, we think, in quantities sufficient to affect the prosperity of other oilfields.

There can be no doubt that a new British oilfield would be valuable to the chemical plant manufacturers; the supply of tanks, oil refining plant and other necessary equipment would provide useful outlet for their activities. We are less certain about the position of the hydrogenation scheme of I.C.I. A cheap supply of home-produced oil in really large quantities would completely kill the Billingham scheme and would lead to an unfortunate loss of capital invested. It is possibly with this in mind that the Government is taking steps to control the development of any oil that may be discovered. Nevertheless, we repeat that there is no need for alarm among the shareholders of I.C.I., or of other oil companies. Oil unquestionably exists in England, and there are many recorded instances of the discovery of oil deposits; with so much

coal in the country it would be surprising if it were not so, but, in the words of the Geological Survey report, " the importance attached to them has been out of all proportion to the quantity of oil obtained or the permanence of the supply."

Award of the Bessemer Medal

THE metallurgical profession looks forward each year with considerable interest to the announcement of the name of the recipient of the Bessemer Medal. In giving this medal metallurgists are accustomed to honour one of their fellows who has been conspicuous in his field, and who, by developing some phase of the art of working in metals, has earned international commendation. It was, therefore, with no little surprise that we learned that this year the Iron and Steel Institute has asked His Majesty the King to accept the medal. In expressing our surprise we must not be accused of any feelings of disloyalty. In asking that His Majesty should accept the award, the Institute is not honouring the King; it is asking the King to honour the Institute by his acceptance of its gift. It would have been difficult, if not impossible, for His Majesty to refuse, so that whatever criticism there may be directed to the action is obviously levelled solely at the Council of the Iron and Steel Institute. The Bessemer Medal has been and should be reserved for a metallurgist. By going outside the profession, the Council are virtually saying that they cannot find a metallurgist of sufficient eminence to justify this year's award—an obvious canard. If the Council are desperately anxious to receive the additional honour of the King's patronage, a special medal might have been struck for the purpose, possibly a replica of the Bessemer Medal. We feel that the Council of the Institute has blundered, not the least of its enormities being that of putting the throne into a position open to the wagging tongue of criticism. We should not like to see a similar precedure adopted by other scientific societies, which savours of bringing scientific and literary men back to the " patronage " days of the Middle Ages.

Legislation and the Chemical Industry

WE have previously referred to the advisability of a thorough study of the Acts of Parliament and the Statutory Rules and Orders in Council affecting the chemical industry. This legislation is not made without good reason; moreover, in the event of serious consequences arising from neglect of their observance, it is no defence to plead ignorance. As the Mikado of W. S. Gilbert puts it: " Unfortunately the Law says nothing about ' not knowing ' or ' not being there.' " It is essential for his own safety no less than for the safety of the men dependent upon him for the owner or works manager of every chemical works to know what laws have been made that affect him. Unfortunately it is not particularly easy to disentangle a multitude of laws from their hiding places. It is therefore one of the greatest benefits that the Association of British Chemical Manufacturers has conferred upon its members, in keeping them fully informed of changes in the law. We have before us their current index of Acts and Orders noted during 1933; from this we would particularly refer to the complete alteration of the memorandum relating to the carriage of Dangerous Goods and Explosives in Ships, to the licensing of stills, and to the revision of the Explosives Acts.

There are many small rules designed for the protection of the workers which cannot be known unless the Acts are studied. For example, does every works engineer know that it is illegal to adopt any method of maintaining a reasonable temperature which uses up the air of the room without renewal, or vitiates the air of the room by returning thereto the products of combustion. How does the works office stand in view of this provision, when it uses for heating purposes a flueless gas stove? We have had experience of cases of gassing resulting from a laboratory muffle furnace burning improperly. Does this come under the provision in the event of serious accident? We do not suggest the answers to these questions; we only point out the type of problem that must be ever-present in the minds of the works manager. To quote one other case, there are structural requirements necessary to eliminate all reasonable chance of accidental immersion of any part of the body in dangerous materials; there is a requirement to protect the worker by fencing in any dangerous situation. It is the daily duty of someone to " dip " tanks to ascertain stocks and to measure the make. We recollect instances in which on lifting the manhole cover of a benzol tank, the man responsible was overcome and almost immediately collapsed from a sudden uprush of fumes, this occurring especially in hot weather. Should the manhole be fenced, perhaps with a grill, to prevent the gassed person from falling head-first into the tank? Too great care cannot be taken to become familiar with these problems; all official regulations will handsomely repay frequent reading.

The Future of Rothampsted

IN response to the recent appeal for £30,000 for the purchase of the Rothampsted Agricultural Station, to which editorial reference was made in THE CHEMICAL AGE, April 7, Mr. Robert McDougall, of Cheadle, has given £15,000, and the Sir Halley Stewart Trust has given £5,000, on condition that the remaining £10,000 be secured by May 12, when the option on the land expires. Towards this balance, £1,000 has been given by Sir Bernard Greenwell and another £1,000 by other donors. Efforts are being made to obtain the remaining £8,000, and all friends of Rothampsted are invited to send subscriptions to the Director, Rothampsted Experimental Station, Harpenden. Barclays Bank and the National Provincial Bank have posted the appeal in their rural branches, and the National Farmers' Union has asked its branches to help. A letter from Sir John Russell, the present director of the Rothampsted Agricultural Station, appears elsewhere in this issue of THE CHEMICAL AGE. As Sir John Russell points out, " it would be a grim tragedy if we were to lose these fields now that success seems so nearly within reach." Rothampsted has already achieved world-wide fame as the home of scientific agriculture, but any change of site would greatly disturb the course and success of future experiments.

Annual Report of Imperial Chemical Industries, Ltd.

An Increased Demand for the Company's Products

THE report of the directors of Imperial Chemical Industries, Ltd., for the year 1933, which is to be submitted at the seventh ordinary general meeting at the Central Hall, Westminster, on Thursday, April 19, at 11.30 a.m., makes the encouraging statement that the total volume of the Company's home trade in 1933 was substantially larger than that in 1932. A feature of the year's trading, it is added, was the increased demand from practically all the industries consuming the Company's products, and there is no doubt that, in the difficult conditions of the depression, the Import Duties Act has brought many advantages to British industry, in which the Company has participated, both directly and indirectly.

Alkali and General Chemicals

Sales of alkali products in the home trade showed an improvement, even over the satisfactory figures for the previous year, but in overseas markets sales were adversely affected by increased competition in China and Japan and by the disturbed conditions and low purchasing power in China. There was an increased demand for practically all general chemicals in these groups and in the newer products good progress has been made. The Chemical and Metallurgical Corporation, Ltd., was added to the General Chemical Group during the year, by means of an exchange of shares.

The improvement in the sales of dyestuffs, both in the home and export markets, referred to in last year's report, continued during the year under review. Sales of other products of this group expanded substantially in the home market and were well maintained in the export markets.

Coal production in 1933 remained practically at the same level as in 1932. Home sales of explosives for this purpose followed the same course, while there was some diminution in the home demand from public works enterprise. Demands from abroad were larger, however, so that the total volume of trade improved moderately.

Fertilisers and Synthetic Products

The higher spirit of confidence among the farming community led to a substantial increase in the home consumption of fertilisers; export sales, which are the more important, however, declined, owing to depression in the consuming markets, notably in Spain. The agreement with the more important European producers of nitrogenous fertilisers referred to in the last report was extended to cover the fertiliser year ending June 30, 1934. All efforts to arrive at an agreement with the Chilean producers having failed, competition was accentuated in certain export markets. It is hoped that the coming year will see closer co-operation between the various world producers. Other products manufactured by this group have been in good demand and sales have progressively increased. Still more products have been placed on the market and plans are in hand for further development.

Hydrogenation of Coal

Following upon an announcement in the House of Commons on July 17, 1933, that the Government intended to introduce legislation designed to fix a minimum limit to the amount of protection afforded by the Petrol Duty, the Company decided to proceed at once with the erection at Billingham of a plant for the production of 100,000 tons per annum of petrol by the hydrogenation of coal. This work is proceeding according to programme.

A satisfactory rate of progress has been maintained by the Leather Cloth Group during the year under review.

Throughout the past year the cement plants have worked to full capacity, and there has been a considerable expansion in the demand for new building products manufactured from anhydrite. To meet the growth in requirements, the plant making the "Pioneer" partition block has been doubled at Billingham and arrangements are also being made to manufacture it in the London area. Increased activity in agriculture and the iron and steel and building industries led to a marked expansion of the lime business.

Non-ferrous metal sales, both home and export, compared very favourably with 1932. The production of rolled zinc strip, which formerly was one of this group's minor activities, was developed during the year into large-scale manufacture. Large expenditure has been incurred in recent years on the concentration and modernisation of equipment, in order to provide a manufacturing plant of the highest efficiency. Towards the close of the year negotiations for the purchase of the preference and ordinary shares of the Broughton Copper Co., Ltd., were successfully concluded.

During the year a controlling interest was bought in Croydon Mouldrite, Ltd., manufacturers of synthetic resins and moulding compounds. Several of the operating groups are in the unique position of being able to provide many of the necessary raw materials for the plastic industry, which is at present in its infancy, and intensive research is being carried out on the production and improvement of plastics. Further progress in the development and application of new products in cellulose and other paints and lacquers has been made during the year, and has been accompanied by a satisfactory extension of sales.

Overseas Trade

The selling companies established in China, India, Japan and other Eastern markets continued to develop their business, despite the difficulties arising from nationalistic competition and the maintenance of many forms of trade barriers. Business in the South American Republics was generally quiet, although a slight tendency towards improvement was noticeable, particularly in the River Plate and Brazil. In Canada the depression increased in severity in the early months of the year but lifted later substantially, with beneficial effects on industry. Agricultural purchasing power was further diminished by the fall in value and tonnage of field crops. As a whole, however, the 1933 trade of Canadian Industries, Ltd., expanded.

African Explosives and Industries, Ltd., had another successful year, reflecting the active state of the mining industries of the Union. Sales of explosives expanded substantially and the capacity of the explosives factories is being extended to take care of the increasing demands of the mines. Fertiliser sales also increased satisfactorily in spite of a severe drought, which caused heavy losses to the farmers. In Australia the financial and general position improved steadily throughout the year. The business of Imperial Chemical Industries of Australia and New Zealand, Ltd., benefited in almost every direction from this recovery.

Increasing Importance of Research

In the ever-changing conditions of modern times, research is becoming an increasingly important factor in commercial development. The adjustment of technical, economic and market research to the varying needs of industry and of the community in general is the object of constant study.

Relations between the management and their co-workers have been maintained on the secure foundation of mutual goodwill. During the year the company has been able to employ more than 5,000 additional workers, of whom approximately one-third have been engaged temporarily in connection with new constructional work. The number on short time has also been steadily reduced. The company's relations with the trade unions also continues to be excellent.

Finance

As in previous years, all factories have been maintained in a state of high efficiency; the necessary provision has also been made for depreciation of wasting assets, of minor services and contingencies, and the subsidiary companies in

which Imperial Chemical Industries, Ltd., does not hold the whole of the issued ordinary capital, have provided in their own accounts for depreciation on fixed assets. The total cost of these charges in 1933 was £2,431,865, which has been charged against the profits of the year. Stocks have been valued at cost or market value, whichever was the lower. Following the practice instituted last year, no credit has been taken for foreign dividends where exchange restrictions prohibited the transfer home of cash representing such dividends. These dividends are, however, still unimportant in amount.

The gross income of the Company for the year 1933 amounts to £7,663,945, as compared with £6,415,423 for 1932. After allocating £1,000,000 for obsolescence and £662,340 for the Company's income tax, the net income of the Company for the year amounts to £6,001,605, as against £4,729,072, or an increase of £1,272,533. As before, the year's income contains nothing of an exceptional nature, and relates solely to the year's operations, and includes no sum from profits on the sale of investments After allocating £1,000,000 to general reserve, the balance for the year is £5,001,605, which, with £543,770 brought forward from 1932, gives a total balance available of £5,545,375.

The preference dividends for the year were paid on the due dates. An interim ordinary dividend of 2½ per cent. was paid on December 1, 1933, and the directors have decided to recommend a final ordinary dividend of 5 per cent., making 7½ per cent. for the year and, in accordance with the articles of association, a dividend of 1 per cent. on the deferred shares, leaving a balance of £566,139 to be carried forward to 1934.

The authorised capital is unchanged at £95,000,000. The total nominal issued capital amounted to £77,323,101 at December 31, 1933, an increase of £174,767 on the amount issued at December 31, 1932. This small increase is due to the issue of capital in exchange for further shares in subsidiary companies and to the acquisition of the Chemical and Metallurgical Corporation, Ltd.

Interest in Subsidiary Companies

The Company's interest in its subsidiary companies is to be measured by the aggregate book value of the shares and debentures of the companies, together with the amount of the advances to them for capital expenditure and general development, less debts due to them. The comparative figures at December 31, 1933, and a year earlier, are as follows:—

	Book Value in Balance Sheet at Dec. 31, 1932.	Dec. 31, 1933.	Increase or Decrease.
	£	£	£
Shares and debentures in subsidiary companies in which the Company holds over 50% of the shares, or control	61,740,385	62,526,732	+ 786,347
Add Advances to them for capital expenditure and general development ...	20,209,822	17,443,172	−2,766,650
	81,950,207	79,969,904	−1,980,303
Deduct Amounts written off ...	3,935,675	917,683	−3,017,992
	78,014,532	79,052,221	+1,037,689
Deduct Debts due to them ...	11,706,393	12,957,624	+1,251,231
Total interest in subsidiary companies	£66,308,139	£66,094,597	−£213,542

The assets of the subsidiary companies have been subjected in detail to the annual review, and it has been decided to apply £250,000 of the central obsolescence and depreciation fund and £667,683 of the general reserve to writing down values in the books of the subsidiary companies, a corresponding reduction being made in the book value of the "shares and debentures in and advances to subsidiary companies."

Marketable and Other Investments

The book value of marketable and unquoted investments, excluding Government securities, held by the Company and its home subsidiaries is £8,914,583, or a reduction on last year of £364,694. The major part of the decrease is due to the transfer to "shares, etc., in subsidiary companies" of an investment in a company which by the acquisition of additional shares has become a subsidiary company. Certain marketable debentures were also converted into ordinary shares of the same company. The market value of the marketable investments, or computed value in the case of unquoted investments, at December 31, 1933, is £7,872,468, being £2,533,469 higher than a year before. There was still a depreciation on book value of £1,042,115.

Cash at bankers, in hand and invested in British and Dominion Government securities at December 31, 1933, amounting to £8,264,002 compares with £7,076,269 at December 31, 1932 being an increase of £1,187,733.

The central obsolescence and depreciation fund has been augmented by the appropriation of £1,000,000 and a further £1,000,000 has been added to the general reserve, both out of the year's profits. The total of the amounts written off, amounting to £1,000,000, has been provided by applying the central obsolescence and depreciation fund to the extent of £250,000 and by withdrawing £750,000 from the general reserve. This leaves £4,750,000 in the central obsolescence and depreciation fund, apart from like reserves of subsidiary companies and £9,750,000 in general reserve at December 31, 1933.

Board of Directors

The following directors, who retire under Article 97, offer themselves for re-election:—The Rt. Hon. Lord Colwyn, The Rt. Hon. Lord Melchett, Mr. H. J. Mitchell, Sir Max Muspratt, Bart., and Mr. E. J. Solvay.

The auditors, Thomson McLintock and Co., and Price, Waterhouse and Co., also retire, and being eligible, offer themselves for re-election.

Letters to the Editor

Rothampsted Agricultural Station

SIR,—In THE CHEMICAL AGE of April 7, you were good enough to announce that the Rothampsted Experimental Farm Station was in danger of losing its classical experimental fields unless the sum of £30,000 could be collected for purchasing them and the adjoining land.

I am thankful to say that the appeal has been so well received that complete success is now possible if only the friends of Rothampsted will do a little more. This happy result is due to the princely generosity of two gentlemen well known as supporters of good work imperilled by misfortune, and if the Rothampsted fields are saved—and they easily can be now—it will be largely owing to the promptness with which they came forward at a critical moment with their help.

Mr. Robert McDougall, of Cheadle, has offered £15,000, and the Halley Stewart Trust Fund has offered £5,000 towards the total sum required, but both have attached the entirely reasonable condition that the remaining £10,000 shall be raised before May 12, when our option expires. Sir Bernard Greenwell at once gave £1,000 and another £1,000 was promptly secured through the help of old supporters of Rothampsted. A list of these will shortly be issued. The station is thus confronted with the problem of raising £8,000.

Machinery has been set in motion for collecting from others living in country places. Barclays Bank and the National Provincial Bank have kindly undertaken to post copies of the appeal in all their rural branches. The branch secretaries of the National Farmers' Union are helping and so are the rural school teachers. But the countryside, though very sympathetic and appreciative, is not well off, and for much of the £8,000 we shall be dependent on the generous help of public-spirited men and women who, while recognising the importance of agriculture to the community, are not themselves actually farming.

I trust therefore, some of your readers may feel disposed to help us complete this fund. It would be a grim tragedy if, after all, we were to lose these fields now that success seems no nearly within reach. Yet unless this last £8,000 is raised we shall lose them.—Yours faithfully,

E. J. RUSSELL,

Lawes Agricultural Trust,
Rothampsted Experimental Station,
Harpenden.

The New Heavy Hydrogen

By LORD RUTHERFORD, F.R.S.

FOR more than a century scientific men believed with confidence that pure water was a well-defined chemical substance, H_2O, of molecular weight 18. It was only about four years ago that this confidence was slightly disturbed as a result of the study of the isotopic constitution of oxygen. Instead of being a simple element of mass 16, oxygen was found to contain in small quantity isotopes of masses 17 and 18. It was clear from this that pure water must contain some molecules of weight 19 and 20 as well as the normal 18. Since, however, it seemed very unlikely that the proportion of the isotopes could be sensibly changed in the processes of preparation of pure water, this result, while of much theoretical interest, did not appear to have any practical importance. As a result of investigations during the last two years, there has been a revolutionary change in our ideas of the constancy of the constitution of water. This has resulted from the discovery that a hydrogen isotope of twice the normal mass is always present in preparations of ordinary hydrogen. While this isotope of mass 2 exists only in small proportion—only about 1 in 6,000 of the main isotope of mass 1—yet, on account of the marked difference in mass of the two components, the relative concentration of the two isotopes can be varied in a marked way by various physical and chemical processes. This is seen by the fact that we are now able to obtain preparations of water in which the isotope of hydrogen of mass 1 is completely replaced by the isotope of mass 2.

At the Royal Institution on March 23, Lord Rutherford gave some interesting details of the discovery of the new heavy hydrogen, and of the part that it may play in the transformation of elements. This abstract of Lord Rutherford's address is reprinted from a recent issue of "Nature."

Physical Data

The density of the heavy water is about ten per cent. greater than ordinary water; while its freezing point is 3.8° C., and its boiling point 1.42° C., higher. Though in outward appearance this heavy water resembles ordinary water, yet in general its physical and chemical properties show marked differences. Not only does the vapour pressure vary markedly from the normal, but also the latent heat is considerably higher. Both the surface tension and specific inductive capacity are lower while the viscosity is much greater.

When the relative abundance of the isotopes of oxygen was first measured, Birge and Mendel showed that there was a slight discrepancy—only about 1 in 5,000—between the ratio of the masses of the atoms of hydrogen and oxygen measured by Aston by the method of positive rays and the ratio deduced by direct chemical methods. They concluded that this small difference was greater than the probable experimental error in the measurements and in explanation suggested that hydrogen might contain in small quantity—about 1 in 4,000—an isotope of mass 2.

Demonstrating the Presence of an Isotope

Let us consider for a moment how the presence of such an isotope could be demonstrated by direct experiment. Both the H^1 and H^2 isotopes would have the same nuclear charge of 1, and have one external electron, and would thus be expected to give the same type of optical spectrum under the influence of the electric discharge. It is to be remembered, however, that the electron, the movements of which when disturbed give rise to its characteristic radiations, is coupled to the nucleus; and that the rates of vibration, although mainly governed by the nuclear charge, are slightly affected by the mass of the nucleus itself. On account of the greater mass of the H^2 isotope, it can readily be calculated that the Balmer lines in the spectrum of heavy hydrogen should appear slightly displaced towards the red. In the case of the α line, the displacement amounts to 1.78 angstrom units. When an electric discharge is passed through ordinary hydrogen, weak satellites should thus appear on the side towards the red. The presence of such weak satellites in the right position was first detected in experiments made for the purpose of Urey, Brickwedde and Murphy. The intensity of the satellite compared with the strong H α line was difficult to measure with certainty but was found to be of the order of 1 to 5,000. Experiments were then made to enrich the H^2 isotope by fractional distillation of liquid hydrogen, but another important observation was made by Urey and Washbourn, who found that the water in old electrolytic cells contained a larger proportion of heavy hydrogen than the normal. The concentration of H^2 was found to be rapidly enriched by continued electrolysis. This gave the key to a successful method of obtaining heavy hydrogen in quantity. The processes involved were carefully investigated by Lewis and Macdonald, and the electrolysis of water was carried out on a comparatively large scale. Nickel electrodes were used, and sodium hydroxide as an electrolyte. In general, it was found that the escape of H^1 during electrolysis was five to six times faster than that of H^2 relative to their concentrations in the solution. There was in consequence a steady accumulation of the heavy isotope in the water in the process until nearly pure heavy water was obtained. Assuming that the initial concentration of H^2 in the water was 1 in 6,000, about 1 c.c. of pure heavy water should be obtained by electrolysis of 6 litres of water. Lewis ultimately succeeded in preparing many cubic centimetres of heavy water in which ordinary hydrogen was present in very small quantity.

Hydrogen in Organic Molecules

We are all aware of the important part that hydrogen plays in many chemical compounds and particularly in organic molecules. When reasonable supplies of heavy water are available to the experimenter, there will no doubt be great activity in preparing and studying many compounds in which H^1 in the molecule is wholly or partly replaced by H^2. Already a few investigations have been carried out, for example, with ammonia and with hydrogen iodide, in which H^1 is replaced by the heavy isotope. It has been found that in mixtures of light and heavy hydrogen gas, the atoms interchange on a nickel surface at a temperature of about 600° C. and the conditions of equilibrium and heat evolution have been investigated. During the next few years we may expect an intensive study to be made of the change of properties of compounds in which heavy hydrogen is used. For instance, it will be of particular interest to examine the changes in the rates of reaction at different temperatures when heavy hydrogen is substituted for ordinary hydrogen.

The discovery of the new water will also be of great importance in another direction, namely, its effect on the processes occurring in animal and plant life. There has not yet been sufficient time to make more than a few preliminary experiments in this field, and then only on a small scale. Lewis finds that seeds of a certain tobacco plant did not germinate in pure heavy water but did so when the concentration of heavy hydrogen was about one-half. In experiments by other observers, well-defined physiological effects have been obtained for quite small concentrations of heavy hydrogen in water. Further observations in this highly important field of inquiry will be awaited with much interest.

It is widely recognised that the new hydrogen will prove of so much general importance to chemistry and physics that it is desirable to give it a definite name and symbol. Urey, its discovered, has suggested that the isotope of mass 1 should be called "protium" and the isotope of mass 2 "deuterium"; while the nucleus of heavy hydrogen, which

has already been found very efficient as a projectile in transforming matter, should be called "deuteron" or "deuton." The question of a suitable nomenclature is one of general importance to scientific men and deserves careful consideration. The name "diplogen" (διπλους, double) for H^2 and "diplon" for the nucleus seemed to find some favour in England as an alternative. The symbol D for the heavy isotope seems appropriate.

Methods of Isolation

While diplogen (or deuterium) may be separated in quantity from heavy water in nearly a pure state, it is of interest to refer to another method of separation employed by Hertz. By utilising a special diffusion method devised by him, he has been able to separate from ordinary hydrogen gas about 1 c.c. of diplogen in such purity that the Balmer lines of hydrogen were not visible in its spectrum. With such pure material, it should be possible to study in detail the complicated band spectrum of diplogen and compare it with that of hydrogen.

Sufficient evidence is not yet available to decide whether the D nucleus is simple or composite, and there are a number of possible combinations to consider between the four units, the electron, positron, neutron and proton. If we assume, as seems not unlikely, that the D nucleus consists of a close combination of a proton with a neutron, it can be shown from the masses concerned that its binding energy should be somewhat less than 1 million volts if we take the value 1.0067 for the mass of the neutron as estimated by Chadwick. If this be the case, we should expect the diplon to be broken up occasionally into a proton and neutron as a consequence of a close collision with a fast α-particle. Experiments to test this have so far yielded negative results. If this dissociation occurs at all, the probability of such an event must be very small. Lawrence, from a study of the bombardment of elements by diplons, suggests that the diplon may break up into a proton and neutron in the strong electric field close to the bombarded nucleus, but the interpretation of his results is not yet certain. At the moment, therefore, the experimental evidence is insufficient to give a definite decision with regard to the structure of the diplon.

By comparing the scattering of α-particles when passing through diplogen and hydrogen gas, Kempton and Lord Rutherford found that as the result of a head-on collision with an α-particle, the recoiling diplon travels about eight per cent. farther than the proton in a corresponding collision. Such a result is in agreement with calculation. It also seems clear that the field of force round the diplon must be very similar to that of the proton, although it may be expected that some differences would be shown for very fast α-particles if the diplon is composite as we have supposed.

Transmutation of Elements

The discovery of heavy hydrogen has provided us with a new form of projectile which has proved markedly efficient in disintegrating a number of light elements in novel ways. It was a very fortunate coincidence that, when Professor Lewis had prepared some concentrated diplogen, his colleague at the University of California, Professor Lawrence, had available his ingenious apparatus for producing high-speed protons and other particles with an energy as high as two million volts. When diplogen was substituted for hydrogen, the diplon (D+) was found to be about ten times as efficient in promoting some transformations in lithium as H+ of equal energy. It will be remembered that Cockcroft and Walton found two years ago that lithium, when bombarded with fast protons, was transformed, with the emission of swift α-particles. It seems clear that in this case the lithium isotope of mass 7 is involved. A proton is captured by the nucleus and the resulting nucleus breaks up into two α-particles, ejected in nearly opposite directions, according to the relation:—

$$Li_3^7 + H_1^1 \rightarrow He_2^4 + He_2^4$$

The emission of other particles of short range has also been observed but the exact nature of the transformation which gives rise to them is not yet clear.

When lithium is bombarded with diplons instead of protons, different types of transformation occur. In one case it seems that the lithium isotope of mass 6, after capturing a diplon, breaks up into two α-particles according to the equation:—

$$Li_3^6 + D_1^2 \rightarrow He_2^4 + He_2^4$$

In this case also, as has been shown beautifully by the expansion photographs obtained by Dee and Walton, the two α-particles are shot out in opposite directions and with a speed greater than the swiftest α-particle from radioactive substances.

Still another interesting type of complex transformation occurs in this element. Oliphant and Rutherford observed that lithium when bombarded by diplons gave, in addition to the group of fast α-particles first observed by Lawrence, a distribution of α-particles of all ranges from 7.8 cm. to 1 cm. in air. It is believed in this case that the isotope of mass 7 captures a diplon and then breaks up into two α-particles and a neutron according to the relation:—

$$Li_3^7 + D_1^2 \rightarrow He_2^4 + He_2^4 + n_0^1$$

This transformation is in close accord with the conservation of energy when the change of mass and the energies of the expelled particles are taken into account.

Emission of Neutrons from Lithium

The emission of neutrons from lithium has been observed by Lauritsen and also in our experiments. In addition, Lawrence has shown that a number of other light elements give rise under bombardment to groups of fast protons and in many cases also to α-particles and neutrons. While the interpretation of the experimental results is as yet only clear in a few cases, there can be no doubt that the use of heavy hydrogen will prove invaluable for extending our knowledge of transformations and thus in helping to throw light on the structure of atomic nuclei.

The importance of this new projectile in studying transformations is well illustrated by some recent experiments made in Cambridge with Oliphant and Harteck. When diplons were used to bombard compounds like ammonium chloride, NH_4Cl, and ammonium sulphate, $(NH_4)_2SO_4$, in which ordinary hydrogen was in part displaced by diplogen, enormous numbers of fast protons were found to be emitted, even for an accelerating voltage of 100,000 volts. In fact the number of expelled particles is far greater than that observed in any other type of transformation at this voltage. The main groups of expelled protons had a range in air of 14 cm., corresponding to an energy of 3 million volts. In addition to this group, another strong group of singly charged particles were observed of range in air only 1.6 cm. Both of these groups contain equal numbers of particles.

Result of a Close Collision

In order to account for these observations, it seems likely that, as the result of a close collision, the diplon occasionally unites with the struck diplon to form a helium nucleus of mass 4 and charge 2, but containing a large excess of energy over the normal helium nucleus. The new nucleus is in consequence explosive and breaks up into two parts, one a fast proton and the other a new isotope of hydrogen H_1^3 of mass 3. If this be the case, the proton and H_3 nucleus should fly apart in opposite directions. It can be simply calculated that the range of the recoiling H^3 nucleus under these conditions should be 1.7 cm.—a range agreeing closely with that actually observed. The changes occurring are illustrated by the equation:—

$$D_1^2 + D_1^2 \rightarrow He_2^4 \rightarrow H_1^3 + H_1^1$$

From the known masses of D and H^1 and the energy of the observed motion of the H^1 and H^3 particles, it can be deduced that the mass of this new hydrogen isotope is 3.0151.

In these experiments, large numbers of neutrons are also emitted. It appears probable that these arise from another mode of disintegration of the newly formed helium nucleus according to the relation:—

$$D_1^2 + D_1^2 \rightarrow He_2^4 \rightarrow He_2^3 + \text{neutron}$$

an isotope of helium of mass 3 and a neutron being expelled in opposite directions. There is strong evidence that such an isotope of helium also appears when the lithium atom of mass 6 is bombarded by protons, and from this transformation it appears that the mass of this isotope is 3.0165. It is quite likely that the helium nucleus of mass 3 formed in this way

is unstable and may possibly break up into $H_{\overline{=}}^{3}$ and a positive electron.

While the conclusions outlined above are to some extent provisional and require confirmation by other methods, there can be no doubt that the effects which follow the collisions of a swift diplon with another are of much importance and interest in throwing light on possible modes of formation of some of the lighter nuclei. It is also of interest to speculate why the heavy isotope of hydrogen appears in many cases far more effective, for equal energies, in producing transformations than the lighter isotope. On the general theory of transformation proposed some years ago by Gamow, it is to be anticipated that, for equal energies of motion, the diplon on account of its heavier mass would have a smaller chance of entering a nucleus than the swifter proton. It may be, however, that normally only a small fraction of the protons which actually enter a nucleus are able to cause a veritable transformation, the others escaping unchanged from the nucleus. On this view, the greater efficiency of the diplon in causing transformation may be due to the fact that a much larger fraction of those which enter the nucleus are retained by it, leading to a violent disintegration of its structure. It may be too that the diplon on entering a nucleus breaks up into its component parts. The appearance of the proton as well as the neutron in some of the transformations may be connected with the composite structure of the diplon.

British-Made Pfaudler Equipment

A New Factory Established in Scotland

ALTHOUGH three factories were already engaged in making Pfaudler glass lined equipment in various parts of the world, a fourth factory has recently been established at Leven, Fifeshire. This factory occupies approximately 2½ acres, but future extensions have been taken care of by the acquisition of adjoining land.

The new buildings are an attractive example of modern factory architecture. The general plan of the works takes the form of a letter L, both extremities of which are served by the company's railway sidings, thus permitting raw materials to be brought into the works at one end and the finished glass lined equipment to be taken out at the other. The tank shop is well supplied with rolls, shearing, punching and drilling machines, and a fine high-speed welding plant has also been installed. Close-by are the grinders and sand-blasting rooms where the tanks are prepared for the enamelling department. An inspection of the sand-blasting rooms reveals a comparative freedom from the usual dust laden atmosphere and we are informed that the rooms have been constructed according to an improved design in order that a ventilating system could be installed which completely changes the air in the rooms at the rate of from four to five time per minute.

In the enamelling department the attention of the visitor is particularly attracted to the large furnace which rises to a height of nearly fifty feet. Its design and construction are quite new and in conjunction with an unique tank-handling crane for placing the tanks into and removing them from the furnace, presents a most ingenious arrangement. Gas for the furnace is produced by the Company's own plant and like much else in the factory, is almost automatic.

The factory will also have the benefit of a well-equipped machine shop, pattern shop and foundry, as well as its own railway rolling stock and electric power generating plant. Practically the whole of the factory and its equipment has been drawn from British sources, so that henceforth Pfaudler equipment will be made by British workmen and machines from British materials in a British factory.

The large number of installations throughout the country is indicative of the increasing appreciation which users here have of the high value of Pfaudler equipment. As most readers of THE CHEMICAL AGE know, the Pfaudler organisation in London has hitherto been responsible only for the sale and distribution of Pfaudler manufactures. A new company has been formed under the name of Enamelled Metal Products Corporation (1933), Ltd., with its registered office at Artillery House, Artillery Row, London, S.W.1.

Mr. James MacGregor, M.I.Chem.E., has joined the board of the new company and will be in control of the sales organisation.

As managing director of George Scott & Son (London), Ltd., and Ernest Scott & Co., Ltd., the well-known chemical engineers, whose head offices are now also located at Artillery House, Mr. James MacGregor, with his technical staff, is well qualified to widen the field hitherto covered by Enamelled Metal Products Corporation, by combining the process knowledge and experience of Scotts with the specialised knowledge and experience of E.M.P. in the use of glass lined equipment.

Mr. T. R. Grimwood, J.P., as a member of the new board, will continue his association with Pfaudler equipment.

The staff of Enamelled Metal Products Corporation, Ltd., including Mr. P. K. MacKenzie, Mr. Barry Cansdale and Mr. P. L. Brunning, who are well known wherever Pfaudler equipment is employed, will be available to advise users on the design and advantages of British-made Pfaudler glass lined equipment.

The Budget "Surplus"

Mr. Neville Chamberlain has to Decide Between Business and Politics

THE national finances are said to be extremely satisfactory; for the Chancellor has achieved the substantial "surplus" of £38,897,728. This happy fact, states "The Independent," of April 7, "will do more good to the world at large than to us, for there is nothing more needed than a little stability somewhere. America has a deficit of £1,500,000,000; Italy, £33,000,000; France's balance on the wrong side reaches astronomical numbers in francs; and most of the nations conform to the suicidal fashion. They are all involved in the risks of currency manipulation and inflationary swindling, and business everywhere is a very desperate affair. . . Mr. Chamberlain has to decide the simple issue between business and politics: whether he will play for passing popularity and give away a lot of money for the further demoralisation of our people, or whether he will remain a sound financier and, by promoting trade, enable the people to earn their money and maintain their characters."

Swiss Chemical Industry

A Notable Increase in Exports

IMPORTS of chemicals and allied products into Switzerland during 1933, as compared with 1932, advanced 5 per cent. in quantities, to 300,800 tons, but decreased less than 1 per cent. in value, to 86,743,000 francs ($16,620,000). Exports showed even a better movement, increasing 20 per cent. in volume, to 82,900 tons, and 7 per cent. in value, to 124,058,000 francs ($25,770,000). Fertilisers, accounting for one half of the total tonnage imported, gained 13 per cent., with larger receipts in all individual classes except prepared fertilisers. Imports of coal-tar products, chiefly crudes and intermediates for manufacture of medicinals and dyes, and rosin and turpentine were somewhat better than in 1932. Exports of fertilisers likewise improved about one-third in tons shipped abroad, the increase occuring in crude nitrate and prepared fertilisers. Exports of indigo and indigo solution nearly doubled; shipments of aniline, anthracene, and other coal-tar dyes, accounting for more than 40 per cent. of the total exports improved 3 per cent. in quantity, to 6,400 tons, and 11 per cent. in francs, to 61,547,000 francs ($11,800,000).

Australian Market for Insecticides

THE market for imported insecticides in Australia has contracted greatly in the last few years, chiefly because of the high import duty, high exchange rates, and competition from locally manufactured insecticides which are using imported pyrethrum. Domestic articles have been able to undersell similar articles imported into the Commonwealth and have secured a strong hold on the market. Australian imports of insecticides and disinfectants declined from £16,726 in 1931 to £9,659 in 1932.

Modern Oil Mill Equipment

Presses and Kettles Incorporate Much Thoughtful Design

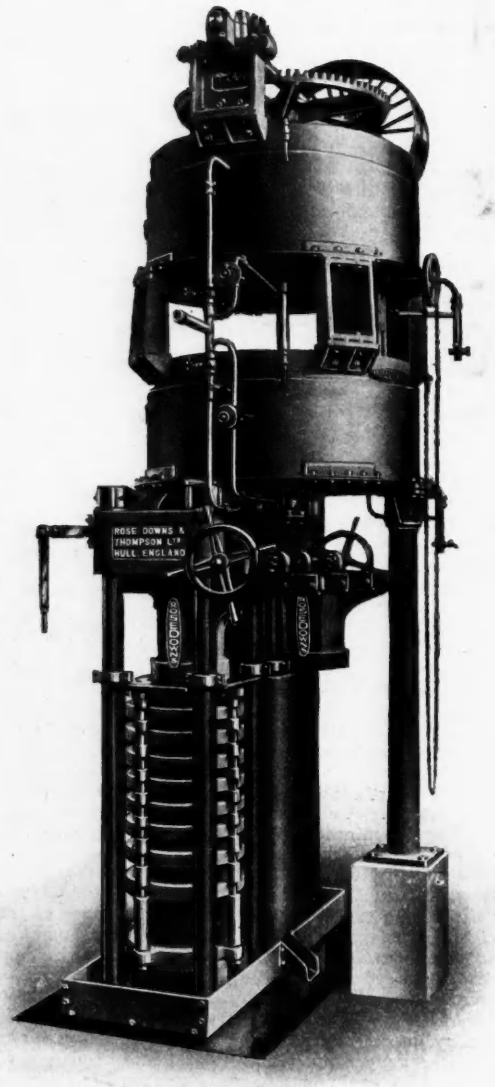
SOME interesting details of the construction of oil mill equipment are contained in a booklet on "Premier Presses and Premier Oil Mills," recently issued by Rose, Downs and Thompson, Ltd., of Hull.

The distinctive feature in the Premier press is the use of a totally-enclosed "cage" or extracting box, and the efficiency of the press is chiefly determined by the efficiency of such cage. The supporting body of the cage in the round-cake types is composed of a number of solid weldless steel rings built together, and for the square types is a massive steel casting, both types being fitted with outside covers to retain the expressed oil and lead it to the collecting tray at the base of the press. The linings of the cage are securely fastened within the body and the whole cage is ground internally, resulting in a perfectly smooth and true working surface, which will not cut the edge of the press mats.

The Cage Lining

The linings are built up of a large number of narrow steel bars of special shape and deep section, set side by side to form the working surface of the inside of the cage. One side of each lining bar is milled with very closely spaced serrations, and the serrated side of one bar fitting accurately against the flat side of the next bar round the whole of the inside of the cage forms a vast number of small perforations for the escape of the oil. The perforations obtained by this method are smaller and much more numerous than can be obtained by any system of drilled-box or slotted stave linings adopted in other makes, and they give a greater and more evenly distributed drainage surface for the escape of the oil, while retaining the meal within the cage. This minimises the possibility of objectionable "spewing" of meal, which is otherwise liable to occur when working very oily materials.

The kettles surmounting the presses are made of boiler-quality mild steel plates, and jacketed on the sides and bottom. They have mouthpieces, fitted with slides in convenient positions for charging the presses below, and are fitted with vertical shafts, carrying stirrers, driven through bevel gears from the horizontal shafts, the latter being fitted with fast and loose pulleys for belt drive. They are also fitted with damping apparatus to supply wet steam to the seed. This consists of a drilled sprayer casting or "rose," which is fitted round the vertical shaft beneath the stirrer which is cranked to clear it. The steam supplies to the rose and to the kettle jacket are independently controlled by wheel valves fitted with dial plates and pointers, enabling the steam supplies to be set at definite points, as determined by experience.



Premier Hydraulic Oil Press with additional Heating Kettle.

The seed, which has been previously treated in the grinding plant, is delivered to the kettle or kettles over the presses, where it is heated, mixed, and tempered as may be necessary. When cold-pressed oils are being produced, no heat would be applied in the kettle, which under such circumstances acts only as a collecting and charging pan for the presses.

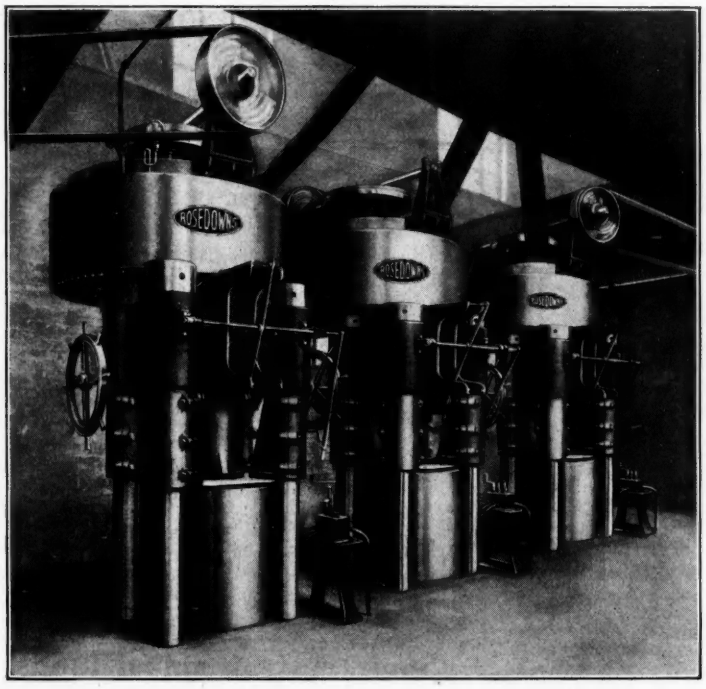
In the bottom of the kettle or kettles are openings which correspond to the cavities in the press heads. These measuring chambers in the press heads are large enough to contain sufficient seed for making one cake in the press. They are opened and closed at the top and bottom alternately by means of slides actuated by hand-levers.

To fill the press the workman withdraws, by means of the handwheel, the loose head block from between the press head and the press box. The ram of the press is then pumped up to within about three inches of the top of the box, the space thus left being sufficient to take the first charge of seed. The hydraulic liquid in the cylinder is allowed to exhaust gradually and is controlled so that the ram in the box descends at a suitable speed for the workman who is charging the press.

Charging the Press

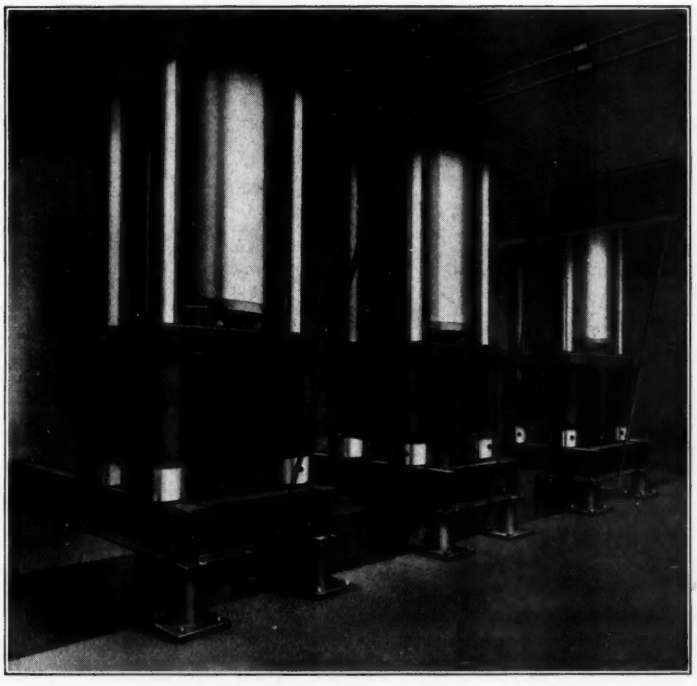
A press plate and press mat are first placed on the top of the ram, and the workman then opens the slide from the kettle to the measuring chamber in the press head, allowing a charge of meal to pass into the chamber. By a reverse movement of the hand lever, the slide at the top of the chamber from the kettle is closed and the slide at the bottom opened, allowing the measured charge to fall into the press box. The lever is then again reversed in order to fill the measuring chamber once more from the kettle, the workman meanwhile levelling the charge of seed by hand, then putting a press mat, a press plate, and another mat on the top ready for the next charge of seed. These operations are repeated until the press box is full.

When the press has been fully charged, the loose head block is returned to its position between the press head and the press box, and the hydraulic pressure is applied. The extracting box is free to rise $\frac{1}{2}$ in. to afford a working clearance, and as the pressure increases, the friction between the walls of the box and the meal will gradually lift the box until it comes into contact with the loose head. Whilst one



THIS view, taken on the upper floor of the mill, shows a battery of Premier Hydraulic Oil Presses and Auxiliary Kettles. In their simplest form these presses are provided with hand-operated filling gear with measured cavities in the press heads, and each press works in conjunction with a single 5 ft. kettle directly surmounting it. Alternatively, instead of being charged through the press head, the press can be fitted with a hand-operated measuring and strickling box working direct from the kettle, which is then situated at the side of the press. The cages are 19 inches in diameter and 9 ft. long, and a total pressure of 800 tons is exerted on the cake.

THE massive construction of the Premier Hydraulic Oil Press is still more noticeable in this view, which is taken on the lower floor of the mill. The ram is 18½ in. in diameter, and the working pressure is 3 tons per square inch. The cage is made in two parts with a spigoted and bolted joint in the centre ring, but when erected a uniform cage of great strength is obtained. Such presses are used for the large-scale treatment of copra, castor seed, palm kernels, groundnuts, sesame seed, tung or wood nuts, babassu kernels, rape seed, poppy seed, niger seed, mowrah and other oil-bearing materials. A large proportion of the world's supply of cold-pressed castor oil is produced in presses of this design.



At Two Floor Levels in a Modern Oil Mill

Reproduced by Courtesy of Rose, Downs and Thompson, Ltd.

press is thus left under pressure, the workman proceeds to empty and recharge the other press.

To empty the press, the hydraulic pressure is momentarily released and the box will gradually drop on to its supporting chairs. The loose head can then be removed by turning the handwheel. Certain materials are of a springy nature and will expand immediately the pressure is released, and the loose head should therefore be run out as quickly as possible to prevent it being jammed against the press head by the expansion of the seed in the box.

After the loose head block has been removed, the pressure is again applied, thus forcing the cakes and the plates out of the box, and these are removed by the workman as they come above the top of the box. They can be taken off in blocks of three or four and separated, the press plates and mats being kept close by for re-filling the press.

Notes and Reports from the Societies

Chemical Engineering Group

Annual General Meeting and Dinner

THE fifteenth annual general meeting and dinner of the Chemical Engineering Group will be held at the Waldorf Hotel, London, on Friday, April 27. The chairman of the Group, Mr. W. A. S. Calder, will preside. The annual general meeting will commence at 6.45 p.m., and will be followed by the annual dinner at 7.15 p.m.

The principal feature of the after-dinner programme will be an address on "Trends in Modern Physics," to be delivered by the Rt. Hon. Lord Rutherford of Nelson, O.M., F.R.S. Lord Rutherford needs no introduction and the Chemical Engineering Group is fortunate in having the opportunity of having the recent and imminent advances in the realm of physics explained by so eminent and experienced an authority. Members who have some difficulty in keeping abreast of the times in this particular direction will be glad to have the guidance of one who was a pioneer in modern atomic physics, and who has remained a leader in it ever since.

The cost of the dinner is 12s. 6d. per head (inclusive of gratuities, but exclusive of wines) and members are cordially invited to bring guests. Ladies are *not* being invited this year. Application for tickets should be made to the Hon. Secretary, Chemical Engineering Group, 307 Abbey House, Victoria Street, S.W.1, not later than April 23.

Society of Public Analysts

Election of New Members

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, on April 4, the president, Mr. John Evans, being in the chair.

Certificates were read in favour of: Frederick Frank Beach, M.A., B.Sc., F.I.C., Thomas Gifford Elliot, F.I.C., Frederick John Flowerdew, B.Sc., A.I.C., M.P.S., John Arthur Heald, M.C., B.Sc., F.I.C., Francis Edwin Needs, F.I.C., and Derrick John Saxby, B.Sc., A.I.C.

The following were elected members of the Society: Ronald Andrew Balding, Bertram Eastwood Dixon, M.Sc., A.I.C., A.C.G.F.C., Arthur Glover, M.Sc., A.I.C., Ralph Gordon Harry, A.I.C., Reginald Milton, B.Sc., Roy Warren Watridge, B.Sc., F.I.C.

The determination of small quantities of fluorides in water was the subject of a paper by Dr. Guy Barr and Mr. A. L. Thorogood, B.Sc. The reagent employed is an aqueous solution of zirconium oxychloride and sodium alizarin monosulphate. The water under examination is acidified with hydrochloric acid and treated with a sufficient quantity of the reagent to give a faint pink colour persisting for 10 minutes, and the colour is matched against that given by standard solutions of fluorine under similar conditions. The test is sensitive for 0.1 part of fluorine for concentrations up to 5 parts per million.

A new test for ethylene glycol and its application in the presence of glycerol, was reported by Mr. A. W. Middleton, B.Sc., A.I.C. This test is based upon the oxidation of glycol to oxalic acid by means of nitric acid, whilst under the same conditions glycerol yields aldehydic substances. The oxalic acid is precipitated as barium oxalate, the precipitate is decomposed, and the oxalic acid identified by a permanganate test. Glycerol does not interfere unless present to the extent of over 75 per cent. of the mixed alcohols, and the test is sensitive to 0.1 gram of glycerol in 10 ml. of aqueous solution.

Dealing with the detection of diamines in leather, Mr. W. Mather, F.I. C., and Mr. W. J. Shanks, jointly described tests whereby extremely small quantities of para- and meta-diamines can be detected in dyed and finished leathers. These diamines can be extracted from leather in the cold by means of N/10 hydrochloric acid or 1 per cent. acetic acid, and precipitation of the extracted tannins with lead acetate does not interfere with the subsequent tests for diamines. The reagents used include 0.1 per cent. solutions of dimethyl-*p*-phenylene diamine, dimethyl-aniline, aniline, *o*-toluidine, *p*-phenylene diamine, and *m*-toluylene diamine. The characteristic colours obtained with these reagents were given in a table.

Society of Chemical Industry

Manchester Section: Detection of Hydrogen Sulphide

A MEETING of the Manchester Section of the Society of Chemical Industry was held at the Engineers' Club, Manchester, on April 6, under the chairmanship of Dr. A. Schedler, when a paper on the automatic detection and control of hydrogen sulphide was read jointly by Mr. G. Minors and Mr. S. Roberts. The authors gave a description of an apparatus which operates on the principle of the interruption of light rays to a photo-electric cell. A strip of laboratory filter paper impregnated with a 20 per cent. solution of lead acetate containing glycerol is inserted between a light source and a photo-electric cell, and on contact with hydrogen sulphide the paper is stained and its optical transparency diminished. The reduced intensity of the light falling on the photo-electric cell is translated by suitable equipment to operate an alarm bell and to start machinery, such as a centrifugal pump, the action of the apparatus being recorded by a milliampere recorder. The sensitivity of the prepared paper has been determined under two conditions, namely, passing the gas along the surface of the paper and passing the gas through the paper. Under the first condition a concentration of hydrogen sulphide of 450 parts per million gives an immediate stain, and the sensitivity ranges down to a lower limit of 40 parts per million, resulting in a similar stain in five minutes. The sensitivity can be greatly increased under the second condition of passing the gas through the paper. By this method it is possible to produce a similar depth of stain in three minutes by passing a gas containing only two parts of hydrogen sulphide per million through the paper. The apparatus is a very flexible unit and can not only be employed to detect varying concentrations or amounts of hydrogen sulphide, but can be readily adjusted to operate with other reaction papers to detect other gases.

Chemical Engineering at Manchester

Chemical engineering at the Manchester College of Technology was described by Mr. W. Cowen. Unlike the courses at other schools of chemical engineering in this country, said Mr. Cowen, the course at Manchester has been designed primarily for undergraduates and leads to the degree of B.Sc. Tech. (Hons.) in the University of Manchester. The foundation of this course is a training in chemistry, and for the first

two years of the students' training no distinction is made between those who are preparing for a degree in chemical technology and those who hope to proceed to the degree in chemical engineering. Alongside the initial training in chemistry, both classes of students are introduced to those branches of mechanical engineering which are of importance in the design and construction of chemical equipment. An attempt has therefore been made to keep the course as flexible as possible, so that a student need not decide whether to take advanced chemistry or chemical engineering until the beginning of his third year. Again, the work in the final year has been so arranged that it meets the requirements of those who have graduated either in chemistry or engineering and who desire to take up chemical engineering.

Chain Length of Cellulose Molecule

The possibility of a direct chemical method for the determination of the chain length of the cellulose molecule was dicussed in a joint paper by Mr. S. M. Neale and Mr. W. A. Stringfellow. The suggested method consists in an attempt to hydrolyse cellulose by means of water vapour in the presence of a suitable catalyst, to measure the extent of hydrolytic degradation by observing the fall in water vapour pressure in a closed system, and to correlate the data thus obtained with changes in the viscosity of the cellulose in solution, thereby obtaining a check upon the applicability of Staudinger's equation. It will be noticed that the hydrolysis data, *per se*, afford no absolute measure of the molecular weight. Quantitative considerations show that, assuming an initial molecular weight not greater than about 200,000, it is possible so to choose conditions that even for the first stage of hydrolysis (that is, degradation to M=100,000) the resulting fall in pressure is of the order of a few mm. of mercury. Difficulties arise owing to sorption by the cellulose and by the glass apparatus, but preliminary experiments, using a very careful high-vacuum technique, suggest that these may be overcome, and some interesting results have been obtained for absorption of water vapour by cellulose at rather low pressures (0.04 to .18 mm. Hg.). In trying to make use of hydrochloric acid vapour as catalyst, with the bulb containing the cellulose steam-jacketed to facilitate reaction, marked charring has occurred.

Mining Institute of Scotland

Annual General Meeting

THE annual general meeting of the Mining Institute of Scotland will be held at the Royal Technical College, Glasgow, on Wednesday, April 18, at 5 p.m. Arrangements have been made whereby Dr. F. S. Sinnatt, director of fuel research, London, will deliver an address. The council of the Institute have also decided to ask Dr. Sinnatt to attend an informal dinner (ordinary dress) at the close of his address.

Society of Glass Technology

Developments in the Decolourising of Glass

A FILM exhibiting glass making processes was exhibited by Mr. W. G. Riley, director of J. Walsh Walsh, Ltd., Soho and Vesta Glass Works, Birmingham, at a meeting of the Society of Glass Technology, held at Stourbridge, on March 21, with the president, Mr. G. V. Evers, in the chair.

Recent developments in the decolourising of glass were reviewed by Professor W. E. S. Turner, who explained the principles involved in the process of decolourising. Colouring oxides were derived from raw materials, refractory materials and fuel dust. Decolourising could be attempted by oxidation of the ferrous oxide; also by neutralising the colour produced by ferric oxide by the use of other colouring agents such as the oxides of manganese, cobalt, nickel and selenium. According to Jaeckel, the decolourising effect of neodymium oxide and nickel oxide was due to the additive colour neutralising action of the two oxides on the colour produced by iron. Manganese, however, did not behave in the same way, and it was thought that a colourless compound of manganese and iron oxides was formed in the glass. After referring to the work of Loeffler and to researches done in the Department of Glass Technology at Sheffield, Professor Turner concluded by saying that the best way to decolourise glass was to eliminate the necessity for the decolourising altogether, *i.e.*, by cutting down the iron content. In cases where careful control had been kept on every source of iron, in making crystal glass, the need for decolourising had been eliminated for several months.

Failure of Glass Melting Pots

The testing of glass house pot clays was discussed by Dr. J. H. Partridge, B.Sc., who enumerated the causes of failure of glass melting pots and briefly described methods for assessing the resistance of specimens made from different mixtures to various forces tending to cause failure. The behaviour of pots in service was correlated with the results of laboratory tests, enabling a specification to be compiled based upon certain physical properties of the clay rather than upon its chemical composition. One of the most tedious tests, said Dr. Partridge, was that of determining the limiting creep strength of the clays and new apparatus was described for this purpose. It was shown that the limiting creep strength at high temperatures was affected most markedly by an increase in temperature and by the presence of certain impurities in the clays.

Annual General Meeting

THE seventeenth annual general meeting of the Society of Glass Technology will be held in the Applied Science Department, The University, Sheffield, on Wednesday, April 18, at 2 p.m., when the election of President and other officers and members of Council will take place. An amendment of rules will also be taken for consideration, the Council of the Society recommending that the subscription of collective members be increased from £3 3s. to £5 5s. a year, and that a new grade of membership, namely, that of Fellow, be instituted.

AN ordinary general meeting of the Society of Glass Technology will be held immediately following the annual general meeting, when the following papers will be read:—"The Development of Mechanical Methods of Glass Manufacture in Europe," by Professor W. E. S. Turner; "The Testing of Glass Bottles for Chemical Durability," by Professor W. E. S. Turner; "Note on the Preparation of Sodium Carbonate free from Iron Oxide," by W. H. Withey, B.A.

London Section Summer Visit

Arrangements are being made for the London Section to visit Cambridge on Saturday, July 7. In the morning the party will visit the works of the Cambridge Instrument Co., Ltd., and in the afternoon there will be a conducted tour of Peterhouse and King's College Chapels.

Indian Science Institute

Forthcoming Staff Changes

UNDER the guidance of Sir C. V. Raman, the Institute of Science, Bangalore, is being completely overhauled and economy is being effected, while at the same time increasing the efficiency of the Institute. A large number of research assistants, including men of over ten years' standing, have been served with notices terminating their services. The Institute will also have a central workshop which will amalgamate within itself the existing small scale shops in each department. The biochemistry department will further be extended.

Some protests have been raised against Sir C. V. Raman's action, and it is understood that a meeting of the Governing Council has been called to consider the matter.

Dr. H. E. Watson, professor of inorganic and physical chemistry at the Institute since 1911, is now retiring. He was given a farewell address by the present and past students of the Institute. The professorship in organic chemistry is also now vacant, and it is understood that Professor Bradfield, who is now working under Dr. J. S. Simonson, at Manchester, will be appointed to it.

The Chemical Age Lawn Tennis Tournament

Enter Early for 1934

LAST week's preliminary announcement concerning the fourth annual CHEMICAL AGE Lawn Tennis Tournament, open to all men engaged in any capacity, as principles or members of staffs, in the chemical industry in Great Britain, aroused an immediate interest in what has now established itself as a popular social event in the chemical industry calendar, and entry forms are now being forwarded to applicants in London and the provinces. Intending entrants who have not yet done so are urged to apply at once for entry forms, which must be completed and returned to the Editor of THE CHEMICAL AGE not later than April 30. For the benefit of any who may have overlooked them we reprint below the rules governing the Tournament and we shall welcome inquiries from anyone who may still be in doubt on any point of detail.

The Chemical Age Silver Challenge Cups, one for the doubles and one for the singles, will be awarded, to be held jointly for twelve months by the winners and the firms they represent, and there will also be, as in previous years, smaller trophies to be presented outright to the successful players and the runners-up. For the first two seasons the Tournament was confined to doubles, and THE CHEMICAL AGE Cup went, in the first year, to a London pair and in the second year to a pair from North Wales. Last year both the singles and doubles were hotly contested right up to the finals and in both instances there was a close fight between London and Lancashire—London eventually winning the two events. As soon as entries are closed on April 30 the provincial entries will be divided into convenient geographical areas so that, in the early rounds, travelling difficulties may be reduced to a minimum. There is no entrance fee of any kind, but it must be understood that competitors (or their clubs or firms) pay their own travelling expenses in connection with all matches.

Not only has the Tournament been carried through with the utmost sportsmanship in the previous three years, but it has afforded us and many members of the chemical industry opportunities for making and cementing friendships which would otherwise have been impossible, and it is in this spirit that we look forward to receiving applications for entry forms from those who have competed before as well as from a large number of new competitors. We would urge the desirability of *early* application in order that plans for the various rounds may be made as early in the active tennis season as possible.

Rules

1. Every competitor must be a member of the chemical industry, either as a principal or a member of a staff. There is no entrance fee of any kind.
2. Each pair in the Doubles Tournament must be members of the same, or an associated, firm.
3. The Challenge Cups shall be competed for annually on courts of any surface in accordance with the Rules of Lawn Tennis and the Regulations of the Lawn Tennis Association. The winners of the Cups shall make arrangements for their safe custody and insurance.
4. The competition shall be conducted on the knock-out principle, and the best of three advantage sets shall be played in all matches, except in the Final of the Singles, when the best of five sets shall be played.
5. **Entries shall be made not later than April 30, 1934, and addressed:**

"Lawn Tennis Tournament,"
"The Chemical Age,"
Bouverie House,
Fleet Street, London, E.C.4.

6. The draw shall be made on the first convenient day following the close of entries. The dates on or within which the several rounds must be played will be published in THE CHEMICAL AGE.
7. The Editor of THE CHEMICAL AGE shall have the right to scratch any players who fail to play on their matches by the stipulated dates, or who otherwise fail to conform with the rules and regulations governing this competition.
8. Except in the case of the special period set apart for the final stages of the competition, players drawn against each other must make their own arrangements for playing off their match on a court mutually agreed upon. In the event of disagreement, the first name drawn shall have the right to choose the ground.
9. In the general interests of competitors throughout the country it has been decided to divide into areas as far as possible all matches up to, and including, the Semi-inals, the rule as stated under Clause 8, however, still standing.
10. The result of each match must be sent by the winners to the Editor of THE CHEMICAL AGE, signed by all players (winners and losers), immediately after the match, and must reach the office of THE CHEMICAL AGE not later than by the first post on the day following the final day for playing off the round.
11. If any player be not present at the agreed place or time of the match, opponents shall be entitled to a walk-over, after having allowed reasonable time (say, a maximum of one hour) for the other's appearance. If the players find it impossible to play off their match on the day originally chosen, they must play it on any other day, to which both sides agree, within the stipulated period.
12. Any dispute arising between players, or otherwise, shall be referred to the arbitration of the Editor of THE CHEMICAL AGE, whose decision shall be final.
13. While competitors will decide as to hard or grass courts for the preliminary rounds, it must be understood that the Finals will be played on courts selected by the Editor of THE CHEMICAL AGE.

National Physical Laboratory

Recent Published Investigations

PAPERS read or published from the National Physical Laboratory during March, 1934, include:—

"Study of the Influence of the Intercrystalline Boundary on Fatigue Characteristics." By H. J. Gough, M.B.E., D.Sc., M.I.Mech.E., F.R.S., D. G. Sopwith, B.Sc., and H. L. Cox, B.A. Read before the Institute of Metals in London, March 7, 1934.

"Minimum Dimensions of Test Samples for Brinell and Diamond Pyramid Hardness Tests." By G. A. Hankins, D.Sc., A.R.C.S., A.M.I.Mech.E., and C. W. Aldous, B.Sc., A.C.G.I. Read before the Institute of Metals in London, March 7, 1934.

"Transverse Tests on Sand Cast Aluminium Alloy Bars." By C. E. Phillips, A.C.G.I., D.I.C., and J. D. Grogan, B.A. Read before the Institute of Metals in London, March 8, 1934.

"The Constitution of the Silver-Beryllium System and the Tarnish Resisting Properties of Certain Silver Alloys containing Beryllium." By H. A. Sloman, M.A., B.Sc., A.I.C. Read before the Institute of Metals in London, March 8,1934.

"Constitution of the Magnesium-Rich Alloys of Magnesium and Nickel." By J. L. Haughton, D.Sc., F.Inst.P., and R. J. M. Payne, B.Sc. Read before the Institute of Metals in London, March 8, 1934.

"The Experimental Side of Colorimetry." By J. Guild, A.R.C.S., D.I.C., F.Inst.P. Published in the "Journal of Scientific Instruments," *11*, 69.

"The Radiation from the Inside of a Circular Cylinder, Part 3." By H. Buckley, M.Sc., F.Inst.P. Published in the "Philosophical Magazine," *17*, 576.

"An Interferometer Microscope." By C. Durbar, M.Sc. Published in the "Journal of Scientific Instruments," *11*, 85.

"Yellow-Blue Ratio and Personal Errors in Heterochromatic Photometry." By W. S. Stiles, B.Sc., Ph.D. Published in the "Philosophical Magazine," *17*, 660.

"Particle Size and Concentration in Opal Diffusing glasses. By C. Dunbar, M.Sc. Published in the "Journal of the Society of Glass Technology," *17*, 411.

"An Apparatus for Thermal Analysis of Alloys containing a Segregating Constituent." By R. J. M. Payne, B.Sc. Published in the "Journal of Scientific Instruments," *11*, 90.

Air Conditioning in Factories

Conference and Exhibition at Leeds

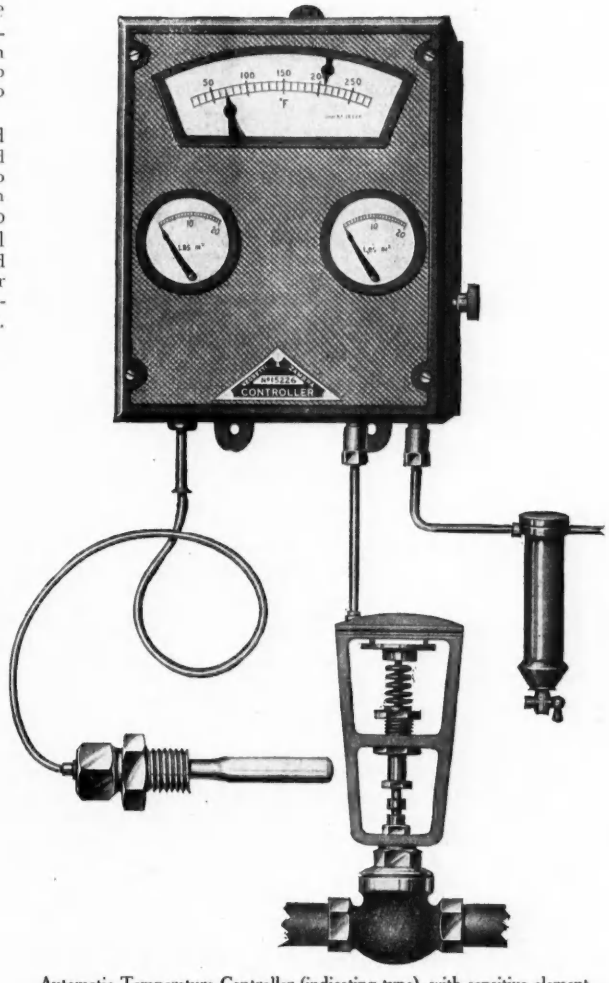
AIR conditioning problems were discussed at Leeds on April 6, on the occasion of a conference held by the Society of Chemical Industry. This conference was the first of its kind, but its success was indicated by the presence of over two hundred scientists and industrialists. The proceedings began with the opening of an exhibition of air-conditioning equipment and control apparatus. At the actual conference papers were submitted by Dr. Ezer Griffiths (National Physical Laboratory), Dr. M. C. Marsh (Wool Industries Research Association), and Dr. Lampitt (chairman of the Food Group of the Society of Chemical Industry and chief chemist to J. Lyons and Co.).

Dr. Griffiths described recent work in hygrometry, and said that the subject was one that had only been appreciated in this country in recent years, an impetus being given to that interest by the demand for air-conditioning plants in hotels and cinemas. Submitting as his own contribution to the discussion a sketch of the recent work at the National Physical Laboratory, Dr. Griffiths said that hyrgometers had been designed with particular requirements in view. For cold storage work a multiple junction thermo-electric hygrometer, combined with a resistance thermometer was used.

Automatic Water-Operated Air-Filter (Casella and Co.).

The wet and dry bulb had been found a very adaptable instrument, and the dew point hygrometer was used in various forms, in one of which a photo-electric cell was employed as a detector of the dew point. A study of such matters as change of dimensions with humidity necessitated the development of apparatus adapted for the study of a number of samples simultaneously, and another point which required attention was that of time lag.

Dr. M. C. March, in a paper on "Air Conditioning in Industry," declared that the absence of a really good, reliable and accurate hygrometer, had been responsible for the neglect of humidity questions by many industries. The wet and dry bulb hygrometer was inconvenient, indirect, and in the unventilated form usually used, was unreliable.. The inconvenience could be overcome either mechanically or electrically by more complicated instruments, and by additional expense. Hygroscopic instruments depending on hairs and membranes were more convenient but more variable especially where exposed to extreme humidity, and in ordinary use they were found to be exceedingly unreliable unless frequently checked. An instrument based on sounder principles would be a great boon. The dew point suggested itself at



Automatic Temperature Controller (indicating type), with sensitive element, controlling Valve and Air Filter (Negretti and Zambra).

once, but the difficulties of making it continuous, self-indicating or recording and capable of being worked in draughts, and perhaps in dusty atmospheres, were great. The methods of measuring humidity in the future might be in some way of which we had at present little expectation.

Again, neither the two types of automatic humidity controls in general use—the wet bulb and the hygroscopic control—could be regarded as ideal, and attempts had been made to use other principles. It could be said that humidity control and measurement neded much research in order to establish some new basis of working. On the question of increasing and decreasing humidity there was apparently little room for development in the construction of spray heads, but the methods of application to existing buildings deserved attention. The difficulty was to get uniformity of humidity. A unit heater was now being made which combined a heater and humidifier, and another interesting inno-

vation recently was the use in the tobacco industry of a simple syray humidifier in which compressed air was replaced by steam.

At this stage of the conference Dr. Lampitt, who had so far been in the chair, gave place to Mr. W. A. S. Calder, chairman of the Chemical Engineering Group, and Dr. Lampitt then read a paper on "The Use of Conditioned Air in Food Manufacture." He pointed out that the need for artificial regulation of the atmosphere arose from the necessity of producing goods at a steady rate despite the interference of weather the need for translating manufacturing processes from suitable to unsuitable climates and the urge to make a better article. He described the main divisions of air conditioning, first that concerned with the full control of relative humidity and temperature, the conditioning necessary when a process demanded that such conditions should not be exceeded, and that where only one factor was of importance; there were also cases where the air was required not only to maintain a certain state but to do work in abstrating heat or moisture, and finally there was the case where filtration of the air to remove dust, mould, and bacteria was desirable.

Dr. Lampitt illustrated these needs by the processes necessary in food factories. The operations of dough mixing, fermentation and baking, for example, all needed consistent conditions of temperature and humidity and the advantages of cooling bread in conditioned air were being urged. The speaker proceeded to describe operations to control maxima temperature and humidity in storage conditions, the maintenance of correct dew point in chocolate manufacture, and the relative humidities needed for hard-boiled sweets and toffees. As an example, a case of cooling goods without dry was then dealt with, the product in point being Swiss rolls, which had to be cooled to a point suitable for the spreading of various fillings, for if drying occurred the sponge cracked on rolling. Cooling was effected in tunnels through which air passed at 70° F., maintained at 90-95 per cent. humidity by water sprays. Dr. Lampitt said that what was needed now was more flexibility of plant used in air conditioning in food manufacture, and cheaper installations. If these demands could be met the use of such plant in food factories would see a big increase, for the industry already realised the advantages to be gained.

The Importance of Factory Site

Dr. J. T. Dunn presided at an informal dinner in the evening, after which a discussion was held on the papers read at the conference. Dr. Barker, director of the Wool Industries Research Association, said that if one intended to humidify in a factory, it was necessary first of all to make a careful study of the site and if possible with a plan of the machinery, so that one would know the conditions that were going to exist. The position of a building relative to the wind and sun was of supreme importance. He had seen a new factory recently in which a great deal of glass was used, most of which was placed on the north side: there was a difference of 40 per cent. humidity between one side of the factory and the other. Major H. J. W. Bliss, a former director of the Wool Industries Research Association, also spoke, pointing out that it was doubtful if most scientific men realised fully the effect of humidity on everything around them. Dr. Speakman, of Leeds University, said that the most hardened manufacturer would admit that yarn and cloth produced under standard conditions would be better than yarn produced under haphazard conditions, but what was needed was a knowledge of the cost per unit of production; there was still need, too, for a reliable instrument for measuring humidity under ordinary industrial conditions.

A number of chemists connected with the food industry also spoke, a good deal of the discussion being concerned with bread. Dr. Lampitt discounted the suggestion put forward by Major Bliss that the baker's object was to sell as much water as possible. His object, said Dr. Lampitt, was to produce a loaf that would sell, and if it had too much water in it would neither bake properly or sell. Mr. C. W. Herd, of the Royal Flour Mills, said that at present the miller made allowances for changes in atmosphere; he thought the inclusion of air conditioning in mills would not necessarily improve the product.

Mr. C. N. Potter, of Ilford, Ltd., emphasised the importance of air conditioning in the manufacture of photographic sensitised materials, a point to which his firm had attended for a great many years. Mr. F. Davidson, of the same firm, said they had found hair hygrometers for use in commercial work to be very good indeed for normal work, provided they were checked at intervals, and a capable workman was quite able to take readings from a wet and dry bulb.

Exhibition of Equipment

Professor N. M. Comber, chairman of the Yorkshire Section of the Society, opened the exhibition at which some twenty-four firms and the Wool Industries Research Association contributed to what is believed to be the first comprehensive assembly of the equipment and apparatus concerned with air conditioning. The exhibitors included Air Conditioning Corporation (Jeffreys), Ltd., London (photographs and diagrams of installations in textile factories); Andrew Machine Construction Co., Ltd. (fog eliminating plant); Bailey, Grundy and Barrett, Ltd. (thermionic relay for temperature control); James Baldwin and Co., Ltd. (automatic humidity control); Brecknell Munro and Rogers, Ltd. (steam humidifier); Brightside Foundry and Engineering Co., Ltd. (conditioning plant for offices and workshops); British Arca Regulators, Ltd. (regulators of all kinds); Cambridge Instrument Co., Ltd. (combined temperature and humidity recorder, thermometers, new portable humidity indicator, etc.); Carrier Engineering Co., Ltd.; Casella and Co., Ltd. (recorder drums, instruments for measuring humidity and air pollution, Rendall rate-of-drying meter, and Dr. Owens' jet dust counter and smoke emission measuring apparatus); Clarke and Vigilant Sprinklers, Ltd. (humidifiers); Elliot Bros.; Hall and Kay, Ltd. (humidifier on low zone principle); Mather and Platt, Ltd. (humidifying plant and control); Mathews and Yates (conditioning plant); Mellor, Bromley and Co., Ltd. (self-contained humidifier units); Negretti and Zambra (resistance thermometers, humidity recorders, hygrometers, etc.); Ogden Engineering Co., Ltd. (gilled tube air heaters); Reynolds and Branson, Ltd.; Smethurst Industries, Ltd. (humidifier); Textile Air Systems (fabric air filter and diffuser trunk); White's Engineering Co. (spray and humidifier apparatus); Kestner Engineering Co., Ltd. (air-drying plant).

Japanese Chemical Industry

Increased Competition Reported

INCREASED competition in many of the smaller chemical markets was evident in 1933. The relative position of the United States as supplier of rosin, borax, and carbon black to Japanese industry was maintained; but sales of alkalies decreased owing in part to domestic production and in part to larger amounts having been furnished by the United Kingdom and East Africa.

Preliminary statistics for the year 1933 (based on the yen) showed expansion in both incoming and outgoing shipments of chemicals and allied products as compared with 1932 and 1931. Total chemical exports in 1933 reached 75,500,000 yen ($15,200,000), and imports 155,300,000 yen ($31,200,000). Contributing to the betterment in exports were the marked gains in quantity shipments of sulphur, matches, calcium carbide, fertilisers, toilet creams and powders, dentifrices, and other toilet preparations, and coal-tar dyes. Most of the individual chemicals comprising imports were received in smaller amounts than in either 1932 or 1931, outstanding exceptions being phosphate rock, coal-tar distillates, and quinine hydrochlorate and sulphate.

Labour in the German Chemical Industry

A RECENT German census disclosed that in 1932 there were 4,965 chemical plants, which gave employment to 169,963 factory workers and 57,609 salaried employees. Plants employing upward of 50 persons accounted for 83 per cent. of the total number of employed.

The Industrial Uses of Natural Silica—II.

Further Notes on Qualities and Specifications

The first instalment of this article was published in THE CHEMICAL AGE, March 31, page 275, where information was given relative to the use of silica in metallurgical fluxing, for refractories, acid tower packing, as an industrial filler and as an abrasive.

FOR pulpstones employed in grinding wood pulp for paper manufacture, sandstone should be of uniform hardness, possessing a sharp and even grain, and free from clay and other impurities. Good strength and freedom from unsoundness are essential, as heavy stresses are set up by comparatively high speeds and the pressure of the wood under treatment; the stones usually revolve at 200 to 225 r.p.m., and the feed pressure is in the nature of 60 to 125 lb. per sq. in. A good pulpstone should cut fast, and produce fibres which are neither too coarse nor too fine; to produce the long thin fibres the stone should tear and not cut, hence sandstones comprised of subangular grains are desirable.

The true burrstone is a white, greyish or slightly yellowish form of chalcedonic silica; it has a coarse cellular structure, and the holes are frequently due to the loss of calcareous fossils. It has about the same hardness as flint, but is not so brittle and possesses a straight fracture; its sharp cutting power is due to the toughness of the rock and its numerous pores and cavities. Such stones are used in grinding paint, cement, gypsum, fertilisers, etc., and in the preparation of graphite or other minerals, but they are being slowly displaced by wheels of artificial materials.

Sand-Lime Bricks

Sand in sand-lime brick has a two-fold function. Most of it acts merely as an aggregate making up the body of the brick, which is bound together by a cementing material. The remainder supplies silica for the formation of the mono-calcium silicate bond. For this second function a certain amount of very fine material must be present, as the action of lime on the largest grains under manufacturing conditions of temperature and pressure is quite slow. According to certain American authorities at least 15 per cent. of the sand present should pass a 100-mesh sieve, as this fine material is acted upon by the lime in the least possible time; the remainder should be graded from coarse to fine, but oversize grains are objectionable as it then becomes difficult to mold bricks having sharp corners and edges. Extreme chemical purity is not essential, but the sand should be reasonably clean and free from organic substances. Sharp sand is usually requested, but there is no reason why rounded-grain sand will not make a satisfactory brick if enough fines are present.

Moulding Sands

Moulding sand may be separated into two general classes, with and without natural bond. Sand of the first class, when removed from the pit, contains sufficient clay, loam, or other foreign material to bond it when tamped into place around the pattern. Sand of the second class does not contain sufficient natural bonding material, and some such substance as refractory clay or organic binder must be mixed with it. Sand with little or no natural bond is often termed "silica sand" or steel molding sand, as it is generally high in silica and more refractory than the natural bonded sands; in consequence, it is used for steel molding where high refractoriness is necessary. Naturally-bonded sand is sometimes called "foundry sand," "iron-moulding sand," or simply "moulding sand," to distinguish it from "silica sand."

The general properties that determine the value of a sand for foundry purposes are (1) bond or cohesiveness; (2) permeability; (3) grain size; (4) refractoriness; and (5) durability. The bond or cohesiveness is probably the most important property, as it is the bond that allows the sand to be moulded intricately without falling in by its own weight. The material of the bond is usually considered as clay, and generally takes the form of a mixture of hydrated iron oxide and hydrated aluminium silicate. Permeability is important as it allows gases to escape from the hot metal without causing "blows" in the casting; angular, coarse sand has higher permeability than round-grained sand. The size of grain affects permeability and determines the use of the sand. Very coarse material is used for the heaviest work and fine-grained sands for light work and for smooth castings. The coarse sand may be a product which just passes a 3-mesh sieve, about 50 per cent. being retained on 20-mesh. Sand with 75 per cent. or more passing a 200-mesh sieve is considered fine-grained.

Sands high in silica are generally the most refractory; those in which the percentage of alkalies is high are the least refractory. For steel moulding the material should contain more than 96 per cent. of silica before the addition of the artificial bond, which may be fireclay; most naturally-bonded sands contain 75 to 90 per cent. of total free and combined silica, but in some cases the silica may be as low as 55 per cent. The durability of a sand fixes the number of times it can be used and to a large extent the amount of new sand that must be added to a mould, although the latter will seldom be made up entirely of new sand. Lack of durability is due to loss of bond by the dehydration of the clay, and to destruction of the colloids by high temperatures.

Furnace Sand

Sand is used to line furnace bottoms and walls, especially in furnaces for making acid open-hearth steel; it is also largely used in forming the bottoms of copper refining furnaces and reverberatory copper smelting furnaces. Although this sand should have a high silica content, a small amount of bonding material is required to hold the sand in place until the furnace has been fired or "burned in." If the sand lacks bond, plastic fireclay may be added. Many sands used have enough natural bond and are often more desirable than artificially bonded material. Sand as low as 80 per cent. silica has been used in extreme cases, but a silica content greater than 95 per cent. is usually specified. The chemical analysis is important, as it indicates the refractoriness of the sand. The alkali content should be very low, and as clay is the best bonding material it is the least objectionable impurity. The sand should be uniformly graded from fine to coarse, and from 95 to 99 per cent. should be retained on a 200-mesh screen. At the more important producing centres soft sandstone of high silica content is used, as in the crushed form it contains enough bonding material to meet the specifications of the steel industry. Because such sand is comparatively cheap, attempts are always made to find sources of supply near consuming or steel-manufacturing centres.

Filter Sand

Good filter sand must be fairly uniform and fall within certain limiting sizes. It must, moreover, be free from clay and organic matter and of high chemical purity, specifications generally stating that not more than 2 per cent. shall be soluble in hot hydrochloric acid. Other specifications require that the combined lime and magnesia, calculated as carbonates, shall not exceed 2 per cent.; apart from this, the chemical composition is seldom specified. With regard to grain size specifications usually state that no grains shall be larger than a certain mesh and limit the percentage that will pass a 100-mesh sieve, as during the washing of the filter bed with counter-current flow the fines collect in the top part of the sand bed and clog the filter.

Tripoli

Tripoli has many desirable properties for use as a general "filler," the most important being colour (if desired, pure white), relative inertness to chemical action and moderate heat, and comparative ease with which it can be finely pulverised. Due to its absorbent properties it is used to a considerable extent as a mechanical cleanser, in admixture with soap and other detergents. It is often employed interchangeably with pulverised silica for use as a filler or inert extender in paints and transparent wood fillers. As an extender in

paint the material must be pure white and finely ground; for use strictly as an inert extender it should be noted that tripoli surpasses pulverisel quartz, as it does not settle out of the paint mixture so readily. Certain quantities of tripoli are also used as a filler in hard-rubber compounds, especially in making battery jars. It is also reported that it is used as a filler in the manufacture of gramophone records and as a carrier of insecticides for the "dusting" of plants and trees. The material is usually sold by sample, under a reputable trade name, rather than by any definite physical or chemical specifications. The governing factors are the amount of free quartz grains or "grit," colour, and fineness. Material from different districts is to a great extent prepared to suit certain markets and requirements, so that the products are comparable only in a general way. Of the total output of tripoli produced in the United States approximately one-third for use as paint and wood fillers, the balance being for other purposes, mostly abrasive.

Diatomite

The chief value of diatomite depends upon its physical structure. The hollow cells of the diatoms provide a mass of dead air spaces, which are the cause of the low apparent density of the material (0.24 when dry and 0.34 when calcined) and the reason for its value as a heat and sound insulating medium. The exceedingly small size of these cells also makes diatomite useful as a filtering medium, and as an absorbent; good material absorbs four to five times its weight of water. Diatomite can also be classed as a mild abrasive. The original particles are not only rather fine, but owing to their fragile structure they break down easily under pressure. Because of this the material is well adapted for fine metal polishes, buffing compounds, and tooth paste, where a mild but hard abrasive is needed. Considerable quantities of diatomite have been used as an addition to concrete, its purpose being to absorb excess water which is slowly released as the concrete sets and to act in the rôle of a lubricant. As a lubricant it finds considerable use at central mixing plants, as it allows less water to be used and keeps the concrete in a soft, easy-flowing condition for use.

The special characteristics of diatomite open up numerous possible fields for its utilisation. It has already found application as a packing material around glass containers when the contained reagents might cause spontaneous combustion in contact with organic material; as an ingredient in various cements, blackboard crayons, porous chemical ware, dusting powders, and foundry partings; it has also been suggested for use as a filler or packing for gas-absorption towers. Material of the proper physical strength and porosity may be used as a medium through which air is blown into a solution, and the fine size of the resulting bubbles causes intense aeration or oxidation. In the United States over 20,000 tons of diatomite are used annually as a filler in the manufacture of battery boxes.

Glass Manufacture

Most of the sand used for glass making contains more than 99 per cent. silica. Quality depends largely on the kind and quality of glass being made. Glass may be classified according to chemical composition or the predominating basic oxide, or by physical characteristics that are largely controlled by the quality of the sand used. On this basis it may be separated into optical glass, requiring sand of the highest purity; flint glass, for high-grade tableware to be cut and polished, requiring sand almost equal to that for optical glass; plate glass to be ground and polished, requiring a high-grade sand; window glass, and plate glass which is used in the form of ribbed or wired glass, requiring a sand of still less purity; green bottle glass, which may contain much more iron oxide than that of the more colourless glasses; and different grades of amber glass, for which a sand with a fairly high content of iron oxide is permissible.

The Italian Pharmaceutical Industry

An Active and Rapid Growth Reported

THE Italian pharmaceutical industry, which is of comparatively recent origin, has of late years had a remarkable development, closely connected with the expansion of chemical studies and with the research work carried on in the country's laboratories. The industry falls into two main branches, the one engaged in the manufacture of pharmaceutical products which form the basis of medicinal specialities, and the other in the actual making of such specialities, the latter branch including the preparation of sera, vaccines and organic therapeutic products in general. According to the Istituto Nazionale per L'Esportazione, of Rome, in 1911 there were 388 concerns devoted to the manufacture of medicinal products, employing about 3,900 workers. To-day over 1,000 laboratories, with nearly 10,000 employees, are engaged in the industry, the total output of which is estimated at 350 million lire per annum.

A Variety of Raw Materials

Pharmaceutical products are prepared from a variety of raw materials from which drugs are obtained by refining and mixing the salts, distilling the medicinal properties of certain plants, and securing from their various parts extracts in which the healing properties and characteristics of the said plants are preserved. This branch of the industry also prepares the pure chemical substances required in making analyses and for research work, as well as a whole series of synthetic products prepared by formulæ ensuring the presence of the medicinal qualities required.

Some twenty years ago all the chemically pure substances required for analyses and other scientific purposes were imported from abroad. Since the war, the manufacture of these products has grown steadily in Italy, and it can now be safely said that the home industry supplies almost all of them in quantities adequate to meet home needs. The business in organic synthetic products has also grown up almost entirely in the last decade, tends to replace natural by synthetic products, thus making the industry independent of certain raw materials supplied by foreign markets. Among the more important products special mention may be made of hexamethylentetramine, sold under the different trade names used by the various firms (uroformine, formotropine, uretine, etc.), and its derivatives, of which the most important is anhydromethylenecitrate, sold under the trade names of citroformine, diuroformine, formocitrol, etc.; the derivatives of the phenanthridine groups, valued for their antipyretic qualities; ureides valued for their sedative qualities and as remedies for insomnia, the derivatives of pyrazoles (antipyrene, amidoxazolene, pyramones), also well known for their antipyretic qualities; the derivatives of quinoline, antiseptic and disinfectant, among which is phenaquinolincarbonic acid; the derivatives of pyridine, one of which, only recently prepared, is diethylamid, obtained from pyridinecarbonic acid, known by the trade name of cardiamine, used as a cardiotonic; and guaiacol, and the several derivatives obtained from its synthetic preparation, among which potassium and calcium sulphoguaiacol, and carbonate, benzoate, acetate, and cacodylate of guaiacol, etc. In addition there is salicylic acid and some of its derivatives. The manufacture of these acids, which started before the war, has developed on a large scale. Besides salicylic acid, salicylicates of sodium, bismuth, mercury, methyl, and above all, acetysalicylic acid are produced and placed on the market under various trade names (aspiroline, italaspirine, etc.). Among other synthetic products mention must also be made of the compounds used as substitutes for cocaine (novocaine and butyne).

Special efforts have been made in the last few years to increase the number and amount of home manufactured alkaloids. Besides the preparation of juinine and caffeine salts, carried on for many decades past, the preparation of

alkaloids and glucosides of belladonna, hydrastis, broom, pomegranite, ipicaccuana, opium, coca, etc., has acquired importance, and the industry will soon be in a position to meet in full the demand on the home market. Remarkable progress is also being made in the preparation of quinine salts, and a new organisation is being set up which will free the country from its present costly dependence on certain foreign trusts. All these salts (hydrochlorate, hydrobichlorate, sulphate, bisulphate, etc.), are now prepared in Italy by private concerns and by the State monopoly.

Until recently glycerophosphates were imported from abroad, but are now made in Italy in quantities exceeding the requirements of the home market. Mention should be made of glycerophosphates of calcium, sodium, magnesium, etc. In arsenious compounds special importance is now given to the preparation of cacodyls, sodium methylarsenates, and sodium aminophenolarsenates, as also to that of the several synthetic compounds, and to the preparation of trivalent arsenious organic derivatives used to replace foreign arsenobenzoic preparations, such as neo-iacol, neo-iu, and their several compounds. Among the inorganic derivatives of busmuth prepared in Italy, mention must be made of nitrate, carbonate and oxide.

Recovery of Iodine and Bromine

For some years past iodine, formerly imported from abroad, has been distilled from the Salsomaggiore mother waters in quantities already sufficient to meet national requirements. The plants recently installed at Salsomaggiore have indeed an output capacity of 4,000 cubic meters of water per day, ensuring a yield of 200 kg. of iodine. The actual output fluctuates between 25,000 and 30,000 kg. per annum. Other iodine distilleries have been recently opened at Fratta, near Bertinoro, in the province of Forli, and at Monticelli Bagni, in the province of Parma. The iodine is subsequently processed in other factories which prepare bisublimate and all the other salts required by home industries.

Bromine salts are now produced in Italy from the salt-pits at Margherita di Savoia in the province of Foggia, with a potential yield of 250 to 300 kg. per day, which is amply sufficient to meet home needs. The present output fluctuates around 40,000 kg. per annum. Of bromine derivatives the inorganic are those most in demand by the pharmaceutical industry, more especially potassium, sodium, calcium, and ammonia bromides. The Margherita di Savoia plants prepare the several compounds in accordance with the formulæ laid down in the pharmacopoeia and to meet industrial requirements, more especially those of the photographic industry.

The Italian establishments preparing pharmaceutical products are not numerous but they are equipped on up-to-date lines, and are well known for the quality of their output, not only at home but abroad. It is not possible to draw a clear-cut line between the factories preparing pharmaceutical products and those manufacturing medicinal specialities, as many important concerns turn out both. Moreover, some of the big chemical factories have departments specialising in medicinal products. Among the leading producing centres mention should be made of Milan, Turin, Bologna, Florence, Rome and Naples.

Strict Government Supervision

The Act of August 7, 1925, N. 1732, and the regulations thereto, approved by Royal Decree of March 3, 1927, N. 478, require that all medicinal specialities made in Italy be registered and placed under strict government supervision. The aforesaid act and regulations require that pharmaceutical specialities comply with certain rules, under which Italian specialities can only be placed on the market after obtaining a special licence from the Ministry of the Interior (General Direction of Public Health). Foreign specialities can only be placed on sale if a similar examination shows that they correspond to requirements. Registration is refused not only to all products which are objectionable on moral grounds, but also to those which claim to be cures for cancer, lupus, and pulmonary tuberculosis. The reliability of the products of the Italian pharmaceutical industry is therefore guaranteed.

The output of the pharmaceutical and medicinal speciality industry not only meets the demand on the home market but feeds a considerable exports trade now amounting to some 900,000 kg. per annum, valued around 25 million lire.

Outlook in Dominican Republic

Fluctuation of Chemical Imports

MR. H. E. SLAYMAKER, British Consul at Santo Domingo, states in a report on economic conditions in the Dominican Republic, issued by the Department of Overseas Trade (H.M. Stationery Office, 2s. 3d. net) that the prospects for British trade are not discouraging, and, indeed, would be definitely encouraging if shipping connections were established. British agents working in the Republic speak optimistically of the present state of trade, and, although this must not be construed as indicating a big market, it does denote that it is worthy of attention. The essential, as always, is to find a trustworthy and active agent. In 1932 there was a considerable reduction in the value of imports of chemical and pharmaceutical products. The United States lost little ground, exporting nearly 58 per cent. as compared with 59.6 per cent. in the previous year. A law has recently been enacted to the effect that every patent or proprietary drug or medicine, or drug sold under a specific name, whether imported or manufactured in the republic, must be registered with the public health department along with its formula, and pay an annual tax of $10 for registration. This law will tend to reduce the number of medicines known under specific or trade names hitherto sold in the country.

Imports in 1932 included the following items:—Pharmaceutical and chemical products of all kinds ($375,227) 57.67 per cent. from the United States; illuminating oil ($157,757) 80.5 per cent. from the United States; rubber and manufactures ($134,186) 59 per cent. from the United States; oils for table use ($125,087) 42.6 per cent. from the United Kingdom; soap ($112,220 80.3 per cent. from the United States; lubricating oil ($87,960) 89.5 per cent. from the United States; crude oil for fuel ($73,764) 71.4 per cent. from the United States; cement ($60,911) 47.4 per cent. from Denmark; perfumery and cosmetics ($54,317) 45.4 per cent. from the United States; paints and pigments ($35,896) 73.8 per cent. from the United States; copper and manufactures ($29,901) 79.4 per cent. from the United States.

Included in the same volume is a report on conditions in the Republic of Hayti by Mr. F. M. Shepherd, British Consul at Port-au-Prince, who states that the value of imports of chemical and pharmaceutical products in that Republic declined by more than 30 per cent. in 1931-32 in comparison with 1930-31.

Australian Chemical Trade

Higher Imports of Industrial Chemicals

THE general improvement in Australian economic conditions that characterised the year 1933 was reflected in the chemical trade, where imports for the fiscal year ended June 30, 1933, advanced to £4,268,800 from £3,366,000 for 1931-32, though still considerably less than for any of the years 1927-28 to 1929-30. Exports of Australian chemicals are relatively unimportant, and the preliminary figures of value are not entirely comparable, being shown in Australian pounds instead of pounds sterling as in all previous years. However, exports in 1932-33 approximated £728,500 Australian, compared with £590,800 sterling in 1931-32. Except for an increase of industrial chemicals from 27 per cent. of total chemical imports in 1927-28 to 47 per cent. in 1932-33, the chemical foreign trade underwent no outstanding changes.

The United States maintained its 20 per cent. share of Australian imports of chemicals and related products for the year 1931-32. Imports from the United Kingdom fluctuated from 43 per cent. in 1927-28 to 35 per cent. in 1929-30 and 40 per cent. in 1931-32, probably increasing considerably in 1932-33. Imports from Germany have been around 7 per cent. With the exception of the United Kingdom, the United States has furnished the greatest variety of chemical products, shipping some of nearly all the usual commodities in this group. The largest losses in the past 5 years occurred in paints and varnishes, prepared medicines, and toilet preparations.

News from the Allied Industries

Artificial Silk

IN RESPECT OF ALLIANCE ARTIFICIAL SILK, LTD., on March 20, 1934, Mr. T. H. How, of 12 Coleman Street, London, obtained an Order of Court for the appointment of Mr. S. H. Gillett, of 24 Basinghall Street, E.C.2, as receiver, and on March 27, Mr. J. Rout, of Marlborough House, Ipswich Road, Norwich, obtained an Order of Court for the appointment of Mr. A. E. Lark, of 2 South Quay, Great Yarmouth, as receiver and manager.

China Clay

PRESIDING AT THE 15th ANNUAL GENERAL MEETING of English China Clays, Ltd., held in London, on April 6, Mr. R. Martin (chairman and managing director) said that the character of the accounts had changed, owing to the amalgamation, to that of a holding company, and so their chief asset was now represented by shares in English Clays Lovering Pochin and Co., Ltd. In common with most other trades, the china clay trade had felt the full force of the world-wide depression, and had had to put its house in order by discarding uneconomical plants so as to reduce production costs to a minimum. The trade to-day was gradually finding itself in the position that only the most efficient and up-to-date plants were working, or could continue in operation, and thus it might be possible for the industry once again to get together for the mutual benefit of all. He did not foresee any return to the prices ruling during the life of the old China Clay Association, but he did contend that provided they used every endeavour to bring their costs of production to the lowest possible limit, they were entitled to expect from consumers such prices as would leave a reasonable margin of interest for the capital invested. Since the major portion of the products of the china clay industry was exported, a return to normal conditions depended entirely on a better understanding internationally, particularly as regards tariffs and international currency control.

Mineral Oil

A MEETING OF INTERNATIONAL OIL REPRESENTATIVES was to be held in London this week. Mr. W. S. Farish, president of the Humble Oil Refining Co., and Mr. R. G. A. van der Woude, of The Hague, president of the Shell Petroleum Corporation, were understood to be in London for this purpose.

Soap

THE 27th ANNUAL ORDINARY GENERAL MEETING of John Knight, Ltd., was held in London, on April 6, when Mr. Arthur Webber, in the absence of the chairman of the Company, presided. He said that trading conditions during 1933 were extremely difficult, so it gave him considerable satisfaction to tell shareholders that sales of soap during the year were the highest in the history of the company. In seed crushing and oil refining the company was not so fortunate, for, although sales were in every way satisfactory, the margin of profit was extremely small, due to the fact that there was a falling market during the whole of the period. A considerable sum of money was spent last year in reorganising certain departments of the factory, laying down new plant, and in generally improving the smooth flow of production from raw materials to the finished article.

Continental Chemical Notes

DICHLORETHANE IS TO BE MANUFACTURED by the State Mines at Limburg, Holland.

* * *

THE DANUBE STEAMSHIP CO. contemplates the erection of extensive coking and benzol plants near Fünfkirchen, Hungary. Employment will thus be found for about 1,500 workers.

* * *

BACTERIAL PRODUCTION OF CELLULOSE FROM STRAW has been found possible with the aid of organisms found in the dung of ruminants. According to the March issue of "Cellulosechemie," after bleaching, the final product contained 57.23 per cent. cellulose and 3.47 per cent. lignin.

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SATISFACTORY TRIALS WITH A HEAVY OIL extracted from peat by a new process worked out in Leningrad are reported by "Chemische Industrie," March 31, to have taken place on trawlers of the Soviet North Sea Fleet. Up till now no method has been known for converting the so-called neutral peat oils into fuel for heavy oil and diesel motors.

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THE CATADYNE PROCESS OF WATER STERILISATION, based upon the bactericidal action of minute traces of silver ions, has recently been modified so as to do away with the necessity for the earlier somewhat cumbersome apparatus. By means of the electro-catadyne apparatus, described by A. Karsten in "Metallbörse," March 28, a controlled stream of silver ions is fed into the water from massive silver electrodes with the aid of a weak direct current. The maximum voltage for operation is only 1.6, thus avoiding any possibility of electrolytic decomposition. Low running costs and high efficiency are claimed for this plant. Thus, a fair-sized potable water sterilising plant was run in a district notable for the softness of its water, effective sterilisation being recorded when the quantity of ionic silver introduced into the water amounted to 30 to 50 milligrams per cubic metre. This proportion of metallic silver is far below the limit where toxic effects are likely to be induced in human being or animals.

TWO POLISH WOOD DISTILLATION FACTORIES were in operation during 1933 and the sales were maintained on the 1932 level, with the exception of vinegar essence, which fell by 8 per cent.

* * *

PERIODIC CLOSING-DOWN of their nitrogen factory at Ostend was recently decided upon by the Union Chimique Belge, in order to reduce output to the level stipulated by international agreements. The measure took effect for the first time during the three weeks ending April 6.

* * *

A SURVEY OF THE RARER METAL RESOURCES of the Ural region has been made, reports "Chemische Industrie." Molybdenum ores were located in the old copper workings in the Tur massif; cobalt occurs throughout nearly all iron ore deposits of the northern Urals to the extent of 0.2 per cent. (as much as 0.7 per cent. in one area); the estimated vanadium wealth of the whole region is 500,000 tons.

* * *

RESULTS OF INVESTIGATIONS on the possibility of reducing the proportion of mixed nitration acids during nitrocellulose manufacture by operating in presence of an organic diluent are published by Rogowin and Pazadnia in the March issue of "Cellulosechemie." From the numerous liquids possessing the requisite characteristics—indifference to nitric or sulphuric acid, cheapness and absence of solvent or swelling action upon the nitrated cellulose—pentane and carbon tetrachloride were selected. The analytical data derived when working with either liquid indicated that cellulose can be nitrated with nitric-sulphuric acid mixture in presence of a high proportion of diluent, but the ratio of the mixture then calls for certain adjustments. With a 50 per cent. organic diluent, which amounts to a twofold reduction in the quantities of nitric and sulphuric acids, very little reduction took place in degree of nitration and in solubility of the nitration product. Any further increase in the diluent ratio led to a marked falling-off in both respects and gave a useless product.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

DURING the week business in the chemical market has been rather quiet and there have been very few price changes. Quotations are practically unaltered for the usual industrial chemicals. Acetone, anhydrous ammonia, formaldehyde, formic acid and sodium chlorate have been in very fair demand, and there have been steady sales of acetone, oxalic acid and saltcake. The demand for wood distillation products has been maintained except in the case of wood tar and creosote, for which very few inquiries have been received. A particularly good trade is reported in methyl acetone and wood naphtha. The demand for charcoal is not quite so active as of late and stocks are still low. Only a moderate business has been done in most coal tar products. The markets for xylol and pitch are reported dull, and only a few orders have been placed for refined coal tar. Prices are mostly unchanged in regard to pharmaceutical chemicals and business has been rather dull, bromides, hexamine and phenacetin being in gratest demand. Moderate business is reported in the essential oils market.

LONDON.—Chemical markets have displayed a fair amount of activity, the demand being of somewhat improved volume. Prices continue firm and show practically no change. The coal tar products market remains firm and prices show no change from last week.

MANCHESTER.—Business on the Manchester chemical market during the past week has been a little livelier although, in some degree, conditions have still not fully recovered from the slowing down which resulted from the recent holiday stoppages. This applies more particularly, however, to actual new bookings. On the other hand, the movement of most classes of chemical products is about back to the March average, and whilst further progress in this area is slow, the call for the alkalies and the heavy acids, in particular, has not been unsatisfactory this week. Few important changes in prices have taken place, although, with the decline in lead this week the easiness of the lead products tends to be pronounced. Copper sulphate, on the contrary, seems to be somewhat steadier in tone. For the most part, business in the by-products continues on a smaller scale than it was some little time ago and the tendency in a number of instances is toward cheaper rates.

SCOTLAND.—The Scottish heavy chemical market is reacting slowly from the effect of the Easter holidays.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80% £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £15 10s. per ton; powder, £28 10s. in 1-cwt. bags d/d free Great Britain in 1-ton lots upwards.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—LONDON: 9½d. per lb.; less 5%. MANCHESTER: 9¼d. to 9½d.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 8d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £47 10s. per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—LONDON: 11½d. per lb. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 1s. 0½d.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. c.i.f. main U.K. ports for imported material; Cornish nominal. £22 10s. f.o.r. mines. SCOTLAND: White powdered. £23 ex wharf. MANCHESTER: White powdered Cornish, £20 10s. at mines.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BARYTES.—£7 to £8 10s. per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot 35/37%. £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £15 10s. per ton; powder, £17 packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—2s. 7d. to 2s. 11d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3¾d. to 5d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K. Green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb. Liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £3 19s. per cwt.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £27 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £32 to £34; brown, £30

LEAD NITRATE.—£28 per ton. MANCHESTER: £27 10s.

LEAD, RED.—SCOTLAND: £25 10s. to £28 per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £37 10s.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8½d. to 9d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £38.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¼d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: Commercial, 8¼d. to 8¾d., according to quantity inh 2-cwt. drums; B.P., 9d. to 9¾d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot material, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.

RUPRON (MINERAL RUBBER).—£16 10s. per ton.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 10s. contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. net.

SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.

SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.

SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£12 10s. per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.

SODIUM SILICATE.—140° Tw. Spot £8 per ton d/d station, returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground Spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £15 5s. per ton f.o.b.

SULPHUR.—£10 15s. per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON AND SCOTLAND: £12 per ton.

ZINC SULPHIDE.—11d. to 1s. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8½d. to 9d. per lb.; crude, 60's, 2s. 11d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 9d. per lb.; crude, 2s. 3d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale, 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

ANTHRACENE OIL.—Strained, 4½d. per gal.

BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 4d. to 1s. 4½d.; 90%, 1s. 4½d. to 1s. 5½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 3½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3d. to 3½d. f.o.r North; 4d. to 4½d. London. MANCHESTER: 3d. to 4½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4½d. to 4¾d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 8d. to 1s. 9d.; 99/190%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £9 15s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—£2 15s. per ton f.o.b. East Coast port.

PYRIDINE.—90/140, 5s. 9d. to 6s. 6d. per gal.

TOLUOL.—90%, 2s. 5d. per gal.; pure, 2s. 8d.

XYLOL.—Commercial, 2s. /d. per gal.; pure, 2s. 7d. to 2s. 10d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.

p-CRESOL 34-5° C.—2s. per lb. in ton lots.

m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.

DICHLORANILINE.—2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags; £79 5s. in casks, in 1-ton lots.

α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s, 9d. per lb. d/d buyer's works.

o-NITRANILINE.—5s. 10d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.

p-TOLUIDINE.—Spot, 1s. 11d. per lb., d/d buyer's works.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 to £10. Grey, £15 to £16. Liquor, brown, 30° Tw., 7d. to 9d. per gal. MANCHESTER: Brown, £12 10s.; grey, £17 10s.

ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.

AMYL ACETATE, TECHNICAL.—95s. to 110s. per cwt.

CHARCOAL.—£5 10s. to £9 10s. per ton.

WOOD CREOSOTE.—Unrefined, 6d. to 9d. per gal.

WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 3d. jer gal. Solvent, 3s. 9d. to 4s. 6d. per gal.

WOOD TAR.—£2 per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Home: £7 5s. per ton delivered in 6-ton lots to farmer's nearest station. Export: Nominal £5 17s. 6d. per ton f.o.b. U.K. ports in single bags.

CYANAMIDE.—£7 5s. per ton carriage paid to any railway station in Great Britain in lots of 4 tons and over.

BRITISH NITRATE OF SODA.—£7 18s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.

CHILEAN NITRATE OF SODA.—£7 18s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.

NITRO-CHALK.—£7 5s. per ton delivered in 6-ton lots to farmer's nearest station.

CONCENTRATED COMPLETE FERTILISERS.—Prices for delivery up to June next in 6-ton lots to farmer's nearest station range from £10 15s. to £11 6s. per ton according to percentage of constituents.

NITROGEN PHOSPHATE FERTILISERS.—Prices for delivery up to June next in 6-ton lots to farmer's nearest station range from £10 5s. to £13 15s. per ton according to percentage of constituents.

Latest Oil Prices

LONDON, April 11.—LINSEED OIL was barely steady. Spot, £19 5s. (small quantities, 30s. extra); April, £17 17s. 6d.; May-Aug., £18 12s. 6d.; Sept.-Dec., £19 7s. 6d., naked. RAPE OIL was firm. Crude extracted, £25; technical refined, £26 10s.; naked, ex wharf. COTTON OIL was firmer. Egyptian crude, £12 10s.; refined common edible, £15 5s.; and deodorised, £16 15s.; naked, ex-mill (small lots, 30s. extra). TURPENTINE was steady. American spot, 50s. 9d. per cwt.

HULL.—LINSEED OIL, spot, quoted £19 per ton; April, £18 10s.; May-Aug., £19; and Sept.-Dec., £19 10s., naked. COTTON OIL.—Egyption crude, spot, £12 10s.; edible, refined, spot, £14 15s.; technical, spot, £14 15s.; deodorised, £16 15s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £14, naked. GROUNDNUT OIL.—Extracted, spot, £18; deodorised, £22. RAPE OIL.—Extracted, spot, £24; refined, £25 10s. SOYA OIL.—Extracted, spot, £15; deodorised, £18 per ton. COD OIL, 22s. 6d. per cwt. CASTOR OIL.—Pharmaceutical, 35s.; first, 30s.; second, 27s. per cwt. TURPENTINE.—American, spot, 52s. 9d. per cwt.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Application

ORGANIC LUBRICANTS especially with regard to the lowering of the setting point of lubricating oils.—J. Y. Johnson (I. G. Farbenindustrie). Aug. 17, 1932. 407,956.

LACQUER VARNISHES, manufacture and production.—R. S. Morrell, S. Marks, and H. Samuels. Aug. 19, 1932. 407,957.

CONCENTRATED FERTILISER, process of producing.—H. E. Dod. Aug. 22, 1931. 407,988.

DEHYDRATION OF GAS.—Whessoe Foundry and Engineering Co., Ltd., and A. G. Grant. Aug. 11, 1933. 408,009.

SULPHONATION PRODUCTS, manufacture, production and recovery. J. Y. Johnson (I. G. Farbenindustrie). Sept. 17, 1932. 407,990.

COLOURING FOODSTUFFS.—Imperial Chemical Industries, Ltd., and F. Hill. Sept. 21, 1932. 407,973.

HYDROGENATION UNDER PRESSURE of distillable carbonaceous materials.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). Sept. 24, 1932. 407,992.

POLYHYDRIC ALCOHOL-POLYBASIC ACID RESINS.—American Cyanamid Co., and T. F. Bradley. Sept. 24, 1932. 407,965.

ETHYLENE FROM ETHYL ALCOHOL and ethyl alcohol from ethylene, production.—G. F. Horsley and Imperial Chemical Industries, Ltd. Sept. 26, 1932. 407,944.

PLASTIC ELASTIC MATERIALS, methods of making.—Naugatuck Chemical Co. Oct. 27, 1931. 407,948.

PURIFICATION OR REFINING OF OILS containing free fatty acid. Sharples Speciality Co. Oct. 6, 1931. 407,995.

CONDENSATION PRODUCTS from hydroxylated cyclic compounds and acetylene, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Sept. 29, 1932. 407,997.

PHYSICO-CHEMICAL OPERATIONS between gases and liquids such as absorption, evaporation, and combination.—E. A. Gaillard. Oct. 6, 1931. 408,016.

RECOVERING NON-VOLATILE METALS from volatilisation furnace residues, process of and apparatus.—A. Pearson. Oct. 10, 1932. 408,020.

ELASTIC RESINS, preparation.—G. T. Morgan and E. L. Holmes. Dec. 8, 1932. 408,063.

SULPHURIC ACID by the contact process, production.—Metallges Akt.-Ges. Feb. 15, 1932. 408,069.

HARDENING GELATIN, process.—I. G. Farbenindustrie. Feb. 16, 1932. 408,085.

DISTILLING AND/OR PURIFYING FATTY ACIDS and the products resulting therefrom, methods.—New Process Fat Refining Corporation. Dec. 12, 1932. 408,117.

CERAMIC LIQUID RESISTANCES, production.—Porzellanfabrik Kahla. Nov. 28, 1931. 408,123.

SULPHATING THE NON-FERROUS METALS contained in ferruginous sulphide ores or sulphidic roasts, process.—Metallges Akt.-Ges., and C. P. Debuch. Aug. 29, 1933. 408,140.

METAL CASTINGS OF SOUND TEXTURE, process of and mould for the production.—I. G. Farbenindustrie. Nov. 22, 1932. 408,153.

HYDROGENATION UNDER PRESSURE of distillable carbonaceous materials.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). Sept. 24, 1932. 408,002-4.

ETHYL ALCOHOL, manufacture.—H. G. C. Fairweather (Air Reduction Co., Inc.). June 25, 1932. 408,006.

SOLUTIONS, compositions, preparations, and articles having a basis of cellulose derivatives.—H. Dreyfus. Aug. 19, 1932. 407,709.

PRESERVATION OF WOOD, furs and the like.—Grasselli Chemical Co. July 18, 1931. 407,691.

CELLULOSE DERIVATIVES, manufacture of films, sheets, and the like containing.—H. Dreyfus. Aug. 13, 1932. 407,673.

PROCESS for the manufacture of composite titanium pigments.—I. G. Farbenindustrie. Aug. 19, 1931. 407,674.

PROCESS of and apparatus for the production of manure.—J. Metzger. Sept. 14, 1932. 407,713.

DISAZO DYESTUFFS containing copper, manufacture.—I. G. Farbenindustrie. Sept. 21, 1931. 407,684.

DERIVATIVES OF BARBITURIC ACID, process for the manufacture. I. G. Farbenindustrie. Dec. 31, 1931. 407,685.

REGENERATION OF CATALYTIC and like contact masses.—Houdry Process Corporation. Oct. 17, 1931. 407,699.

SULPHURIC ACID ESTERS of leuco derivatives of vat dyestuffs, manufacture.—I. G. Farbenindustrie. Sept. 21, 1931. 407,702.

PRODUCTION OF OINTMENTS containing lithium compounds.—C. Thaler. Oct. 11, 1932. 407,752.

HARD CEMENTED CARBIDE MATERIALS.—A. H. Stevens (Firth-Sterling Steel Co.). Nov. 18, 1932. 407,781.

HYDROCYANIC ACID FUMIGANTS.—N. V. Barton, J. Chapman and Associated Fumigators, Ltd. Dec. 13, 1932. 407,792.

AMMONIACAL LIQUOR, treatment.—W. C. Holmes and Co., Ltd., and C. Cooper. Jan. 10, 1933. 407,801.

PURIFICATION OF LIQUIDS.—M. C. Smith. March 16, 1932. 407,807.

TUBULAR BODIES from viscose, manufacture and production.—Courtaulds, Ltd., and E. Hazeley. Jan. 30, 1933. 407,811.

HEAVY LUBRICATING OILS and products produced thereby, manufacture.—Gulf Refining Co. March 1, 1932. 407,812.

SPRINKLING CAPABILITY of finely granular table salt, process for maintaining.—W. W. Triggs (Daitz Patents Foundation). March 29, 1933. 407,829.

OXALIC ACID, process for preparing.—Consortium für Elektro-Chemische Industrie Ges. May 30, 1932. 407,839.

WATER-SOLUBLE DIAZOIMINO COMPOUNDS, process for the manufacture.—I. G. Farbenindustrie. May 23, 1932. 407,840.

LIGHT-PROOF PIGMENTS, process for preparing.—M. Michels. July 8, 1932. 407,856.

OXIDATION OF AMMONIA, catalyst for.—Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Nov. 2, 1932. 407,893.

IMMUNISATION OF SEED GRAIN and the like.—Grasselli Chemical Co.—July 18, 1931. 407,708.

Complete Specifications Open to Public Inspection

MANUFACTURE OF CATALYSTS.—Intermetal Corporation. Oct. 1, 1932. 25824/33.

CHLORINATED RUBBER, production.—Deutsche Gold- und Silber-Scheidanstalt vorm. Roessler. Sept. 27, 1932. 26122/33.

POWDERED VEGETABLE GLUES, manufacture.—Soc. H. Gouthiere et Cie. Sept. 27, 1932. 26244/33.

VITAMIN PREPARATION, process for the manufacture.—I. G. Farbenindustrie. Sept. 27, 1932. 26487/33.

FATTY SUBSTANCES soluble in strong alkaline baths, manufacture of materials containing.—Deutsche Hydrierwerke Akt.-Ges. Sept. 27, 1932. 26629/33.

AMINO-ALCOHOLS, manufacture.—E. I. du Pont de Nemours and Co. Sept. 27, 1932. 26651/33.

HYDROXYLATED AMINES, manufacture of salts.—E. I. du Pont de Nemours and Co. Sept. 27, 1932. 26653/33.

SEPARATION OF SOLIDS from solutions.—British Celanese, Ltd. Sept. 27, 1932. 26654/33.

VAT DYEBATHS, preparation.—I. G. Farbenindustrie. Sept. 28, 1932. 26731/33.

ACID TRIPHENYLMETHANE DYESTUFFS, manufacture.—I. G. Farbenindustrie. Sept. 29, 1932. 26732/33.

TREATMENT OF CELLULOSE FIBRE, particularly for improving the dyeing properties thereof.—Deutsche Hydrierwerke Akt.-Ges. Sept. 28, 1932. 26783/33.

TANNING SUBSTANCES, manufacture.—J. R. Geigy Akt.-Ges. Sept. 29, 1932. 26836/33.

FINELY-DIVIDED SUBSTANCES, dispersions and emulsions, production.—E. I. du Pont de Nemours and Co. Sept. 30, 1932. 26858/33.

PHOTOGRAPHIC BLEACHING-OUT LAYERS and of dyes therefor, manufacture.—I. G. Farbenindustrie. Sept. 30, 1932. 27052/33.

Applications for Patents

MANUFACTURE of sulphuric acid derivatives of organic acid amides.—Henkel et Cie, Ges. March 17. (Germany, May 12, '33.)

VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. March 16. 8333.

LUBRICANTS, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. March 17. 8436.

TRIALKYLAMINES, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. March 19. 8562.

COLOURED WAX EMULSIONS, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. March 19. 8563.

DRYING GRASS.—Imperial Chemical Industries, Ltd., and W. F. Carey. March 15. 8114.

PRODUCTION of polymerised materials in cast blocks.—Imperial Chemical Industries, Ltd., and J. W. C. Crawford. March 15. 8242.

FUNGICIDES.—Imperial Chemical Industries, Ltd. March 15. 8243.

COPPER-CONTAINING AZO DYE.—Imperial Chemical Industries, Chemical Industries, Ltd. March 19. 8545.

COLOURING MATTERS.—Imperial Chemical Industries, Ltd., and F. Lodge. March 19. 8546.

STABILISING HYDROGEN-PEROXIDE SOLUTIONS.—B. Laporte, Ltd., I. E. Weber, and W. S. Wood. March 17. 8464.

SEPARATION of isomeric pentanones.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. March 17. (Holland, March 27, '33.) 8467.

PREPARATION and use of aluminium compounds.—H. Spence, P. Spence and Sons, Ltd., and G. H. Riley. March 16. 8270.

APPARATUS for concentration of liquids.—Thermal Syndicate, Ltd., and B. Moore. March 19. 8523.

HYDROGENATION of carbonaceous materials.—F. Uhde. March 20. (Germany, March 20, '33.) 8713.

HYDROGENATION of carbonaceous materials.—F. Uhde. March 20. (Germany, March 20, '33.) 8714, 8715.

FILTRATION and purification of oil, etc.—T. E. Beacham and Stream Line Filter Co., Ltd. March 29. 9848.

ORGANIC SUBSTANCES, manufacture.—British Celanese, Ltd., and W. H. Groombridge. April 4. 10178.

RECOVERY OF BASIC REAGENTS.—British Celanese, Ltd., H. F. Oxley and E. B. Thomas. April 4. 10180.

PIGMENT DYESTUFFS, manufacture.—A. Carpmael and I. G. Farbenindustrie. March 29. 9861.

WATER-INSOLUBLE AZO DYESTUFFS on fibre, manufacture.—A. Carpmael and I. G. Farbenindustrie. April 3, 10113.

AZO DYESTUFFS, manufacture.—A. Carpmael and I. G. Farbenindustrie. April 4. 10271.

THERAPEUTICALLY-ACTIVE PREPARATION, manufacture.—A. Carpmael and I. G. Farbenindustrie. April 4. 10272.

PIGMENTS, preparation.—J. O. Cutter, L. A. Jordan, and Research Association of British Paint Colour and Varnish Manufacturers. April 4. 10150.

MINERAL LUBRICATING OILS, improving.—I. G. Farbenindustrie and J. Y. Johnson. April 3. 10034.

ANTHRAQUINONE COMPOUNDS, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. April 3. 10035.

HYDROXY COMPOUNDS of the anthrapyrimidine series, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. April 3. 10036.

DYESTUFF MIXTURES.—I. G. Farbenindustrie and J. Y. Johnson. April 3. 10037.

NITROGENOUS CONDENSATION PRODUCTS, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. April 3. 10038.

DYESTUFFS of gallacyanine series, manufacture.—I. G. Farbenindustrie. April 4. (Germany, April 5, '33.) 10273.

DEGREASING MATERIALS.—Imperial Chemical Industries, Ltd., and J. Savage. April 3. 10123.

CLASSIFICATION of materials by elutriation.—Imperial Chemical Industries, Ltd. March 29. 9910.

SILICATE PAINT.—Imperial Chemical Industries, Ltd., and H. T. S. Swallow. April 4. 10209.

CHROMIFEROUS AZO DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. March 29. (Switzerland, March 31, '33.) 9841, 9842, 9843.

SYNTHETIC RESINS, manufacture.—Soc. of Chemical Industry in Basle. March 29. (Switzerland, March 29, '33.) 9845.

CHROMIFEROUS DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 3. (Switzerland, April 4, '33.) 10056.

MAKING N-CHLORO-AZO-DECARBONAMIDINES.—Wallace and Tiernan Products, Inc. April 4. (United States, March 17.) 10210.

ALCOHOLS, manufacture.—Air Reduction Co., Inc., and H. G. C. Fairweather. March 23. (Jan. 6.) 9211.

GLASS AND ENAMELS, manufacture.—American Potash and Chemical Corporation. March 22. (United States, April 7, '33.) 9045.

CADMIUM, production.—American Smelting and Refining Co. March 23. (United States, March 29, '33.) 9215.

TREATING SULPHATE SOLUTIONS of thallium and cadmium.—American Smelting and Refining Co. March 23. (United States, March 29, '33.) 9216.

POLYNUCLEAR CYCLIC KETONES, manufacture.—A. G. Bloxam and Soc. of Chemical Industry in Basle. March 24. 9305.

From Week to Week

MR. LEONARD GOODBAN, F.I.C., of 43 Addison Gardens, London, W., left estate to the value of £5,359 (net personalty £4,194).

MR. JAMES FULTON, of the Ayrshire Rubber Co., Ayr, has sold this business to Mr. George Pringle.

DR. W. H. COATES, a director of Imperial Chemical Industries, Ltd., was the speaker at the monthly lunch arranged by the Industrial Co-partnership Association on April 12. His subject was "Knowledge of Facts as a Basis of Co-partnership."

SIR FREDERICK GOWLAND HOPKINS, the Sir William Dunn Professor of Bio-Chemistry in the University of Cambridge and President of the Royal Society, has received the honorary degree of LL.D., from the University of St. Andrews.

PROFESSOR A. B. MCCALLUM, F.R.S., one of Canada's leading scientists, died at London, Ontario, on April 5, at the age of 76. He was president of the Royal Canadian Institute from 1895 to 1896, and president of the Canadian Royal Society from 1916 to 1917. His last university position was that of Professor of Biochemistry at McGill University, from which post he retired in 1929.

THE GERMAN DYE TRUST has declared a dividend of 7 per cent. for the past business year, which is the same as last year. Whilst the firm's internal trade has improved its export trade has had to face new difficulties during the past year, but progress made in the first quarter of 1934 is claimed to justify the hope that the Dye Trust will be able to increase its staff of 100,000 people.

APPLICATIONS FOR LICENCES under the Dyestuffs (Import Regulation) Act, 1920, received during March, totalled 843, of which 787 were from merchants or importers. To these should be added the three cases outstanding on February 28, making a total for the month of 846. Of these 824 were granted, 15 were referred to British makers of similar products and 7 were outstanding on March 31. Of the total of 846 applications received, 836 or 99 per cent. were dealt with within 7 days of receipt.

THE DEPARTMENT OF OVERSEAS TRADE announces that the Birmingham Section of the British Industries Fair, 1935, will be held from May 20 to May 31 inclusive. The London Section will, however, as formerly, open on the third Monday in February, *i.e.*, February 18, 1935. This decision follows a recommendation of the *ad hoc* committee of representatives of the London and Birmingham Sections of the Fair set up by Colonel John Colville, M.P., Secretary to the Department of Overseas Trade, to consider the question of the date of the Birmingham Section.

MR. JAMES FAICHEN, manager of the Inveresk Paper Mills, Musselburgh, has retired after fifty years in the industry.

B. C. FUELS, LTD., of Imperial House, Kingsway, London, W.C.2, have increased their nominal capital by the addition of £500 in 10,000 ordinary shares of 1s., beyond the registered capital of £15,100.

THE PRESIDENT OF THE FRENCH REPUBLIC has conferred the honour of the Cross of Chevalier of the Legion of Honour upon Sir Henry Wellcome, F.R.S., the founder of the Wellcome Research Institution.

MR. REGINALD MORTON HUGHES (48), of Strand Road, Calcutta, India, late chairman of Imperial Chemical Industries (India), Ltd., son of the late Charles James Hughes, of Northwich, left estate to the value of £53,009 (net personalty £52,918).

THE STUDENTS' EXCURSIONS which were organised for the first time in connection with the Achema VI were so successful that it has been decided to offer increased facilities and privileges for the Achema VII, which will be held at Whitsun, May 18-27, in Cologne. The value of these students' excursions will be realised from the fact that over 1,000 students, with their lecturers, from Germany and other countries, visited the Achema VI, at Frankfurt on Main, in 1930.

TWO ENGLISH PROFESSORS OF CHEMISTRY received the Degree of Doctor *honoris causa* at the ninth Congress of Pure and Applied Chemistry, which opened in Madrid on April 5. They are Professor H. E. Armstrong, former Emeritus Professor of Chemistry at the City and Guilds College, London, and Professor R. Robinson, Waynflete Professor of Chemistry at Oxford University, who is renowned for his studies of the structure of components of plants.

THE HIGH COMMISSIONER FOR CANADA, in London, has received from the Dominion Bureau of Statistics at Ottawa a limited supply of the official handbook, "Canada 1934," which is intended for free distribution to those interested in the economic development of the Dominion. This handbook contains an introduction of eight pages dealing with the world situation as it affects Canada, and summarising the conditions of Canadian trade and industry at the end of 1933. It discusses phases of national endeavour including population, wealth and production, agriculture, forestry, mining, water powers, fisheries, fur trade, manufactures, transportation, trade, finance, labour, education, etc. Application for copies should be addresed to the Secretary, Office of the High Commissioner for Canada, Canada House, Trafalgar Square, London, S.W.1.

PURSUING THEIR WORLD-WIDE SEARCH for scrap-metal to feed the increasing demands of Osaka's busy factories, Japanese agents are scouring the British West Indies for ancient sugar-making machinery which has been rusting in the canefields for years. Thousands of tons of this machinery, some of which was used in the treadmills by slaves a century ago, are being garnered for shipment to Japan. The metal-hunters, employed by a company registered in Canada, have also bought from the Government discarded railway lines, boiler plates and obsolete oilfield machinery, which are being broken up by dynamite in readiness for a 9,000 miles trip across the Pacific.

THE MANUFACTURING CONFECTIONERS' ALLIANCE and the sugar using manufacturers belonging to the Food Manufacturers' Federation, who between them employ at least 100,000 persons, have jointly lodged with the Ministry of Agriculture objections to the Sugar Marketing Scheme submitted by 22 beet sugar manufacturers and sugar refiners, and have asked the Minister that a public inquiry shall be held as provided for in the Agricultural Marketing Acts. The main objections to the scheme are stated to be that it gives statutory powers to the small number of sugar manufacturers and refiners now in business, setting up a monopoly or trust which would possess absolute power, not subject to Parliamentary supervision, to control supplies and sales, by means of quotas, and in effect to fix prices, without safeguarding the interests of sugar-using manufacturers and of distributors and consumers of sugar for domestic use, and that it is against the public interest in several respects, especially in preventing newcomers entering the trade.

EXPERIMENTS IN THE STUDY OF ATOMIC REACTIONS were described in a paper by Dr. R. A. Ogg and Professor M. Polanyi, which was read before the Manchester Literary and Philosophical Society on March 27. Dr. Polanyi, who was formerly Professor of Chemistry at Berlin, holds the new Chair of Physical Chemistry at Manchester University. The authors presented a theoretical treatment of certain chemical reactions involving the formation of ions. The experiments which they reviewed were part of a general body of work carried on to ascertain the simplest laws of chemical reactivity and their relation to the theory of atomic interaction as expressed by modern physics. They dealt with the reactions of sodium vapour with an organic halogen compound. An endeavour was made to give a description of the motions of the elementary particles (ions and atoms) during the course of the reactions under review, and especially to explain the excess energy (energy of activation) which these particles must possess before they could react.

ACCORDING TO THE "LONDON GAZETTE," April 6, the partnership heretofore subsisting between John Frederick Ingle, Abraham Moise Esses and Denis Wilde Radcliffe, carrying on business as chemical manufacturers, at 51 James Street, Miles Platting, Manchester, under the style or firm of Major Bradley and Co., has been dissolved by mutual consent as and from February 1, 1934, so far as the said Denis Wilde Radcliffe is concerned, who has retired from the firm owing to ill-health. All debts due to and owing to the said late firm will be received and paid by the said John Frederick Ingle and Abraham Moise Esses, who will continue the said business under the same style or firm of Major Bradley and Co.

THE EXECUTIVE COMMITTEE of the National Physical Laboratory has received a report from Dr. H. J. Gough, superintendent of the engineering department, on a visit to numerous technical and research institutions in the United States. In the course of his report, Dr. Gough says: "I have not the slightest idea of the total sum expended in the United States on research, but obviously it must be enormous. It may be that the money is not spent as efficiently as the much smaller amount expended in this country. Nevertheless, industrial research projects in the United States are so actively pursued and are planned on such a scale that I fear their influence on the quality of American products will be such as to constitute a great menace to the future of the industries of this country, as exporters, unless industrial research in this country is comprehensively tackled as a national problem of prime importance. I do not see how, otherwise, this country can hope to compete successfully in the world market."

THE GOVERNMENT OF THE IRISH FREE STATE has appointed the following to be members of the Industrial Research Council which has just been established in that country:—Laurence J. Kettle (chairman); K. C. Bailey, Sc.D.; Professor J. Bayley Butler; Professor T. Dillon, D.Sc.; J. J. Dowlinfi F.Inst.P.; J. J. Drumm, D.Sc.; D. Feighery; Sir John Purser Griffith; Professor F. E. Hackett, M.Sc., Ph.D.; T. Hallissey; H. Kennedy, D.Sc.; Commandant J. F. Kinneen; T. A. McLaughlin, M.Sc., Ph.D.; T. J. Monaghan; Professor T. J. Nolan, D.Sc.; T. O'K. Kinsella; J. O'Neill; Professor A. O'Rahilly, B.Sc., Ph.D.; Professor J. Railly, D.Sc.; Professor Pierce F. Purcell, and Professor F. S. Rishworth. Addressing the members at the inaugural meeting of the Council, the Minister of Industry and Commerce (Mr. Sean Lemass) said that one of the first things he wished the Council to give its attention to was the possibility of the production of oil from the coal and peat resources of the Irish Free State.

Company News

Reckitt & Sons, Ltd.—A profit of £1,143,202 is reported for 1933, against the 1932 level of £1,175,626. The carry-forward is reduced from £201,744 to £147,440.

British Oxygen Co.—A final ordinary dividend of 6½ per cent. is announced, payable on May 4, making 9 per cent., less tax, for 1933, compared with a total of 6½ per cent. for 1932.

North British Aluminium Co.—For the year 1933 the accounts show a trading profit of £104,285, against £90,241 in the previous year, plus interest on investments, £47,124; to debenture interest is placed £104,310, to sinking fund £39,008, to tax £5,889, leaving a net profit of £2,202, reducing the debit brought in to £64,868.

William Blythe & Co.—The accounts for 1933 show a net profit of £25,924, againset £24,763 in 1932. The directors recommend a final dividend on the ordinary shares of 6 per cent., making 9 per cent., less tax, transferring to general reserve £5,000, leaving to be carried forward £4,849.

Aluminium Corporation.—The profit for 1933, after depreciation and other charges, is reported to be £20,767, and, after payment of debenture and mortgage interest, fees, and balance of premium on redemption of mortgage debenture stock, the loss was £1,143, which, added to £19,977 brought forward, leaves a debit of £21,120 to carry forward.

A. and F. Pears.—For 1933 a profit of £50,747 is announced, (against £50,409 in the previous year), including £11,000 from Lever Brothers in respect of advertising expenditure. With £26,230 brought forward, the disposable total is £76,977. A dividend of 6 per cent. on the cumulative preference shares absorbs £12,000 and on the 12 per cent. cumulative preferred ordinary shares, £38,400, leaving £26,577 to be carried forward.

International Aluminium Co.—After depreciation and other charges a profit of £50,704, is shown for 1933, to which is added the balance brought forward £16,071, making £66,775. From this is deducted interest on debenture stock, directors' fees and debenture trustees' fees £19,610, the balance of premium on redemption of 7½ per cent. debenture stock £10,880, provision for tax £5,000 and dividend on preference shares for the year £17,374, leaving to be carried forward £13,910.

Minerals Separation, Ltd.—The payment of a dividend of 10 per cent., on April 19, is announced, making 15 per cent., less tax, for the year 1933.

British Glues and Chemicals.—It is announced that the directors have decided to pay on May 1 a half-year's dividend on the 8 per cent. cumulative participating preference shares to April 30, 1933.

Eastman Kodak Co.—The accounts for 1933 show combined profits of $11,119,044, after charging $2,605,631 for taxes, $5,818,051 for depreciation at usual rates and $750,000 for obsolescence of plant. The profits, after dividends on preferred stock, were equal to $4.76 per share on the common stock, against $2.52 for the previous year.

New Transvaal Chemical Co.—The report for the year to June 30, 1933, states that the balance standing to the credit of profit and loss account, including £16,601 brought forward, is £28,992, out of which dividends on the first preference shares and on the "A" preference have been paid, leaving £4,992. The directors recommend the payment of remuneration of the board £525, leaving to be carried forward £4,467.

American Cyanamid Co.—The report for the year 1933 states that operations resulted in a net profit of $2,467,682, after deducting all charges, including $1,609,631 for depreciation and depletion. At a meeting of the directors held on January 9, the tentative results for 1933 were reviewed, and it was concluded that a special cash dividend of 25 cents. per share should be declared. The board requested that this distribution be regarded simply as a return out of earnings for 1933, and not as the establishment of a dividend basis or policy for the future.

Books Received

The Atom. By John Tutin. London: Longmans, Green & Co. Pp. 103. 6s.

Directory of Paper Makers, 1934. London: Marchant, Singer & Co. Pp. 273. 5s. 6d.

Annual Reports on the Progress of Chemistry for 1933 Vol. XXX. London: The Chemical Society. Pp. 462. 10s. 6d.

Forthcoming Events

Apr. 18.—Royal Society of Arts. "The Utilisation of Coal." William R. Gordon. 8 p.m. John Street, Adelphi, London.

Apr. 18.—Institution of Chemical Engineers. Joint meeting with the Institute of Fuel and the Chemical Engineering Group. "The Economic Generation of Steam in Chemical Works." F. H. Preece and B. Samuels. "The Economic Usage of Steam in Chemical Works." W. F. Carey. 6 p.m. Burlington House, Piccadilly, London.

Apr. 18.—The Mining Institute of Scotland. Annual general meeting. Address by Dr. F. S. Sinnatt. 5 p.m. Royal Technical College, Glasgow.

Apr. 18.—Electrodepositors' Technical Society. "Anodic Oxidation of Aluminium and its Alloys." S. Wernick. 8.15 p.m. Northampton Polytechnic Institute, St. John Street, Clerkenwell, London.

Apr. 18.—Society of Glass Technology. Annual general meeting. 2 p.m. University, St. George's Square, Sheffield.

Apr. 19.—The Chemical Society. "The Periodic Law of Mendeleeff and its Interpretation." To commemorate the Centenary of Mendeleeff. By the Rt. Hon. Lord Rutherford. 8 p.m. Royal Institution, Albemarle Street, London.

Apr. 19.—Society of Chemical Industry (Birmingham and Midland Section). Annual meeting of the Section. "Some Remarkable Properties of Nascent Soap." A. Rayner. 7 p.m. University Buildings, Edmund Street, Birmingham.

Apr. 20.—Royal Institution. "Cosmic Radiation." P. M. S. Blackett. 9 p.m. 21 Albemarle Street, London.

Apr. 20.—British Association of Chemists (Scottish Section). Annual general meeting. 7.30 p.m. Central Halls, Bath Street, Glasgow.

New Companies Registered

Chromium & Nickel Plating Works, Ltd., 6a Seaford Street, Gray's Inn, London, W.C.1.—Registered March 28. Nominal capital £100. Chromium, electro, nickel and metal platers, oxidisers, bronzers, lacquerers, etc.

Kencert Products, Ltd., Waterford Bridge Works, Kentmere, Westmorland.—Registered March 28. Nominal capital £12,000. To acquire (1) trade mark No. 517,719 registered in class 4, (2) the business specialists in diatomite products carried on by S. S. Hughes, J. T. Browne and J. W. Nelson at Waterford Bridge Works, Kentmere, Westmorland, as the "Kencert Products Co.," and (3) from the Kentmere Diatomite Co., Ltd., land, forming part of Kentmere Hall Farm, Kentmere. Directors: John S. Crawhall, William Reikan, Samuel S. Hughes, Alfred Nelson, William G. Middleton, and John T. Browne.

New Chemical Trade Marks

Opposition to the registration of the following trade marks can be lodged up to April 21, 1934.

Tellac. 544,044. Class 1. Anti-corrosive solutions for the treatment of metals. J. H. Tucker & Co., Ltd., Kings Road, corner of Redfern Road, Tyseley, Birmingham, 11. August 25, 1933.

Irgonite. 544,928. Class 1. Chemical substances in the nature of paint, and anti-corrosives. J. R. Geigy Société Anonyme, 215 Schwarzwaldallee, Basle 16, Switzerland. September 29, 1933.

Opposition to the registration of the following trade marks can be lodged up to April 28, 1934.

Bestobell. 547,840. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. January 17, 1934.

547,841. Class 4. Raw, or partly prepared, vegetable, animal, and mineral substances used in manufactures, not included in other classes. Bell's Asbestos and Engineering Supplies, Ltd., 157 Queen Victoria Street, London, E.C.4; and Bestobell Works, Slough, Buckinghamshire. January 17, 1934.

Belvicta. 548,828. Class 1. Preparations for the prevention or removal of boiler scale, water-softening preparations, and anti-corrosives. Joseph Walter Bell, 8 Otto Terrace, Durham Road, Sunderland. February 20, 1934.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Australia.—A Melbourne agent desires the representation of United Kingdom suppliers of acids (citric, tartaric), cream of tartar, medicinal oils, on a commission basis, for Victoria and Tasmania. (Ref. No. 400.)

South Africa.—A Johannesburg firm of manufacturers' agents who work (in conjunction with a sub-agent in the Cape Province) the whole of the Union desire to secure the representation of United Kingdom manufacturers of linseed oil, varnish and enamel, on a commission basis. (Ref. No. 406.)

Czechoslovakia.—A firm of wholesale merchants and commission agents established at Prague wishes to obtain the representation of United Kingdom exporters of raw metals (lead, tin, zinc, nickel and aluminium) and finished aluminium products, on a commission basis. (Ref. No. 409.)

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